JUL 12 1957

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VOL. LII No. 7

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VETERINARY Medicine

Established 1905

features in this issue...

Experimental Transmission of Infectious Bovine Rhinotracheitis to Cattle

Abortion of Fetuses Exhibiting Evidence of Dwarfism

Efficacy of n-Butyl Chloride as an Anthelmintic in Cattle

Newer Treatments for Helminthic Infections

Ornithosis and Leptospirosis Survey

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Egg-Propagated Distemper Virus

Ringworm in Cats

Intramuscular Chloramphenicol in Small Animal Practice

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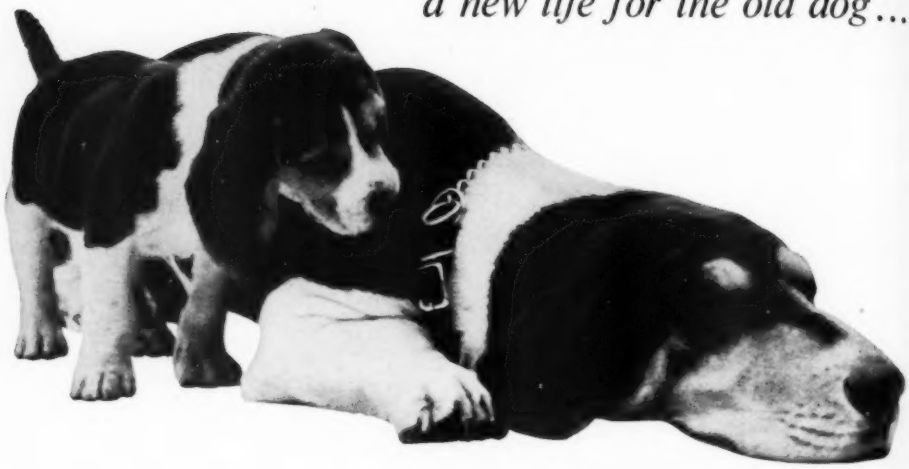

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NEWS COMMENT

Grass Tetany

Welcome, plentiful rainfall over large areas of the Midwest during recent months has stimulated lush growth of pasture grasses. In many sections growth is reported to be best in five years. Fewer cattle than in former years are now grazing on young and rapidly growing range, pasture, and cultivated grasses that produced little growth during recent drought years. Reports suggesting a marked increase in incidence of grass tetany were anticipated and are being received from Oklahoma, Kansas, Nebraska, and South Dakota.

Grass tetany is a rapidly developing, highly fatal nutritional or metabolic disorder of cattle characterized biochemically by lowered blood magnesium and calcium. These findings suggested the now popular treatment (calcium gluconate fortified with magnesium and sometimes phosphorus salts) for parenteral use. Commercial preparations available are servicable generally and in many instances have been life-saving. Treatment must not be delayed. When injected intravenously or intraperitoneally promptly after symptoms develop results are good, but are of less value if delayed. Treatment is virtually of no avail six to ten hours after onset of symptoms. Initial signs of nervousness, restlessness, muscle twitching, unsteady gait, spreading of the hind limbs, gnashing of teeth, and excessive salivation progress rapidly to convulsions, coma, and death.

Under some types of herd management on smaller farms and ranches, medical management presently advised is adequate to hold losses to a minimum. Under large ranch management, however, frequent close inspection is not always possible and significant losses are potential during the months of May and June. The problem appears to resolve itself largely as the season advances.

Use of salt, mineral mixtures, cottonseed meal, grain concentrates, hay, silage, or various combinations of these items of foodstuff or supplements has been suggested as preventive. Experiments have indicated that though these measures may delay onset of the disease they do not prevent it.

In spite of these reported experimental findings, livestock and range (or soil) management apparently play a significant, if not vital role. If the institution of some of these recommended practices (feeding hay and silage, ample supply of well balanced minerals, and salt, et cetera) do little more than encourage consideration of improved herd management, they should prove rewarding until such time as research can unravel what appears to be a rather complex biochemical problem.

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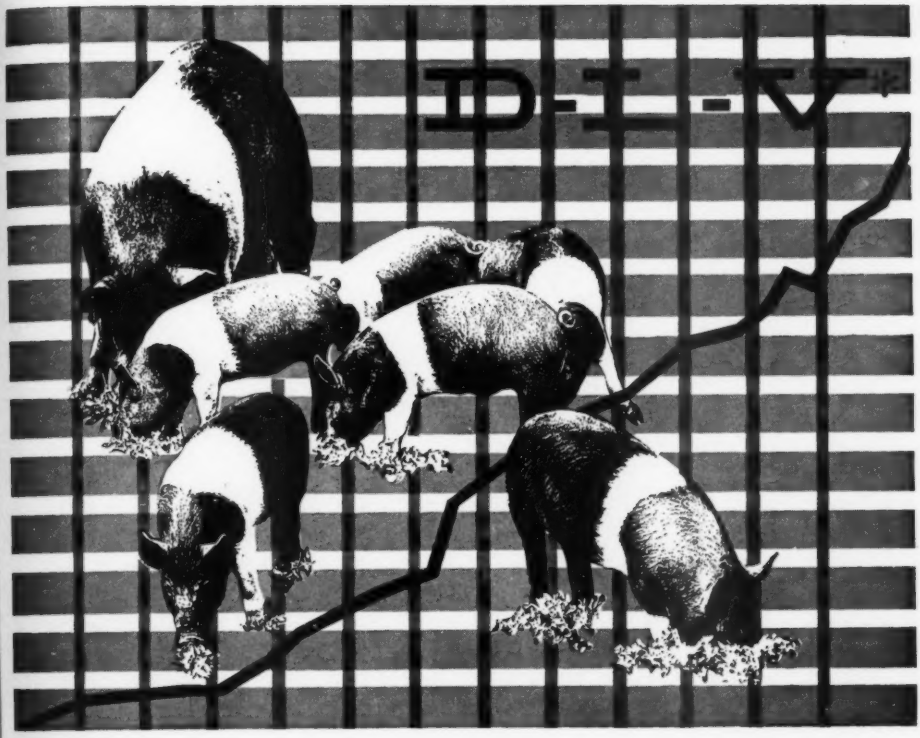

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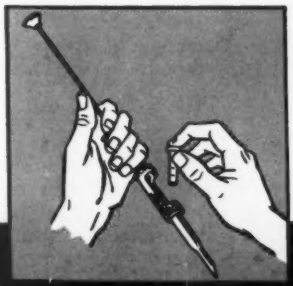
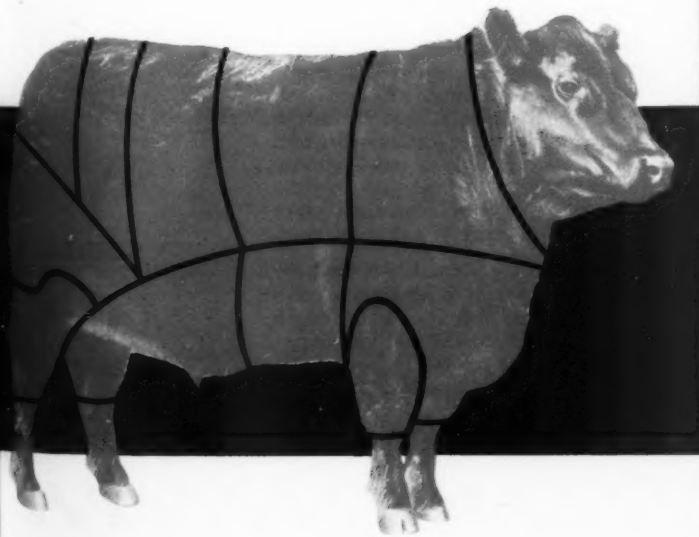


Nick through skin of ear with special scalpel, insert tip of implanter, press plunger to eject all 6 pellets of Synovex.



*R. J. Deans, W. J. Van Arsdell, E. P. Reineke and L. J. Bratzler (Michigan Agricultural Experiment Station): The Effect of Progesterone-Estradiol Implants and Stilbestrol Feeding on Feed Lot Performance and Carcass Characteristics of Steers, Journ. Animal Sci. 15:1020, 1956.

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*Belloff, G. B.: Calif. Vet. 9:16 (Nov.-Dec.) 1956.

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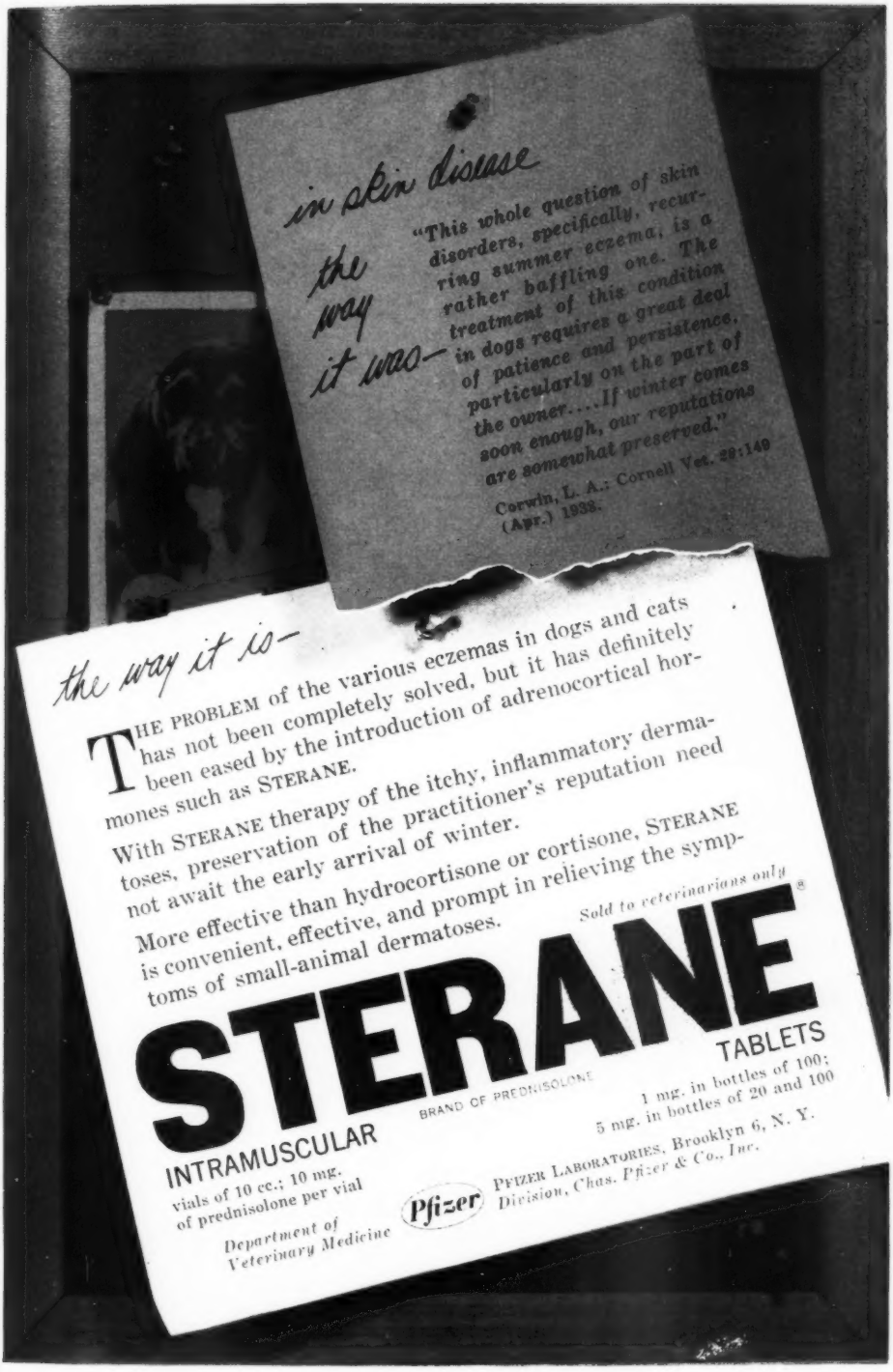
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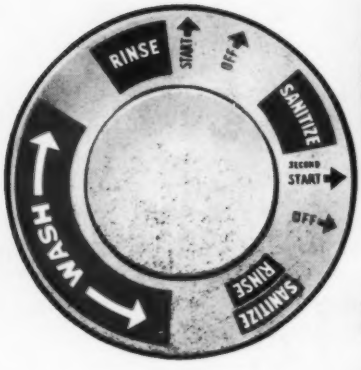

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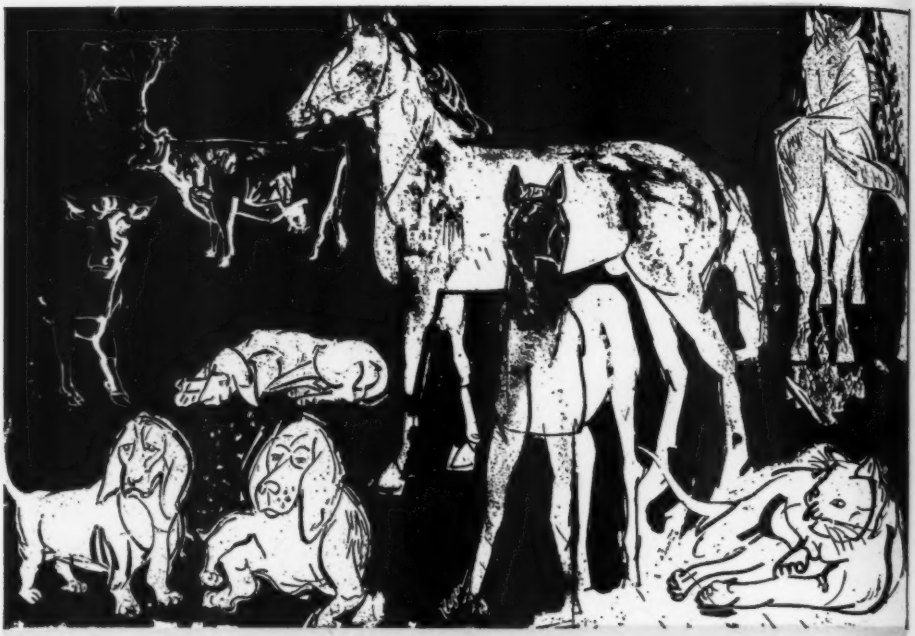

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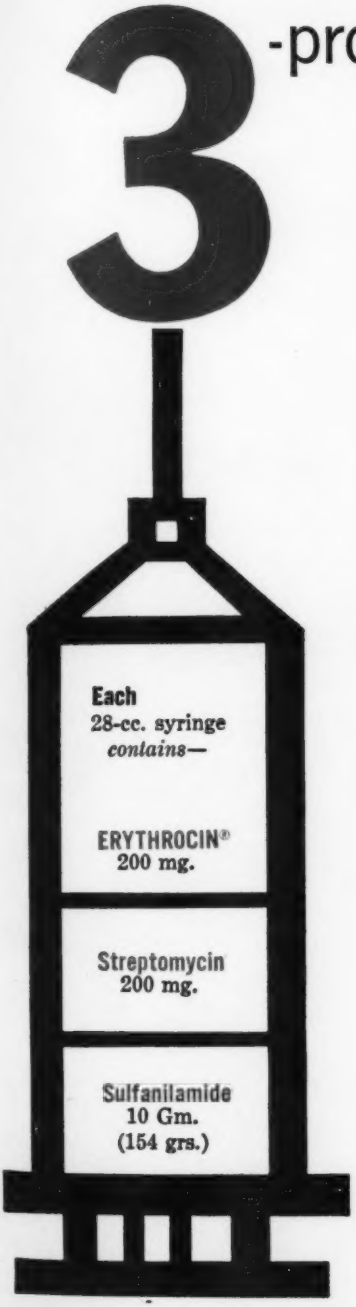

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Studies On Infectious Bovine Rhinotracheitis (IBR) II. Experimental Transmission to Cattle†

ROSS G. BROWN, D.V.M., and VICTOR J. CABASSO, Sc.D.,
Pearl River, New York

EXPERIMENTAL transmission of infectious bovine rhinotracheitis (IBR) to cattle was successfully carried out by McKercher and others,[1] Madin *et al.*[2] and Gillespie and coworkers[3] by administering IBR-infected tissue culture fluid or nasal washings from sick animals, intratracheally or intranasally. The parenteral injection of either blood or spleen from cases of the disease, however, failed to reproduce the infection in susceptible animals.[1] The present communication reports additional observations on the reaction of cattle to tissue culture grown IBR virus administered by various routes.

Materials and Methods

Virus Strains. Two different isolates were used in this study. One was received from the Veterinary Virus Research Institute, Cornell University, Ithaca, N. Y.,* as a specimen of infected calf lung, and will be referred to as the Ithaca strain. The other, designated Blythe strain, was supplied by the Naval Biological Laboratory, University of California, Berkeley, in the form of undiluted fluid of the sixth passage of the virus in bovine kidney tissue culture.

Tissue Culture. Serial passages as well as virus titrations were made in stationary, trypsinized bovine embryo tissue culture tubes prepared by the method of Dulbecco and Vogt.[4] Virus preparations intended for animal inoculation were grown by the same method in Povitsky bottles. In both cases, growth medium consisted of Earle's basal medium[5] containing 20% normal calf serum and lactalbumin hydrolysate[6]: 1 ml. in tube cultures and 100 ml. in Povitsky bottles. Mixture 199[7] was used to renew the cultures before virus inoculation.

Experimental Animals. Milk or beef breeds of cattle were employed. They were purchased from areas where IBR was not known to have occurred. When brought to the experimental quarters, they were kept under observation for at least one week before inoculation, with daily temperature readings. Following inoculation, temperature readings and observations for disease symptoms were made daily for the duration of the experiment. In the first trial, leukocyte counts were also made every day.

Intranasal Inoculation. This was carried out by spraying infected tissue culture fluid into one nostril of the animal by means of a De Vilbiss 40 nebulizer,** under a constant 15 lb. dry nitrogen pressure.

Serum-Neutralization Test. A standard virus preparation was diluted from 1:5 to 1:50,000 in phosphate buffer solution. To aliquots of each dilution, equal volumes of the serum under test, as well as of known immune and

†From the Veterinary Professional Service Department, Farm and Home Division and the Viral and Rickettsial Section, Research Division, American Cyanamid Company, Pearl River, N. Y.

*We are indebted to Drs. J. A. Baker and J. H. Gillespie, Ithaca, N. Y., and to Dr. S. H. Madin, Berkeley, California, for making these viruses available to us.

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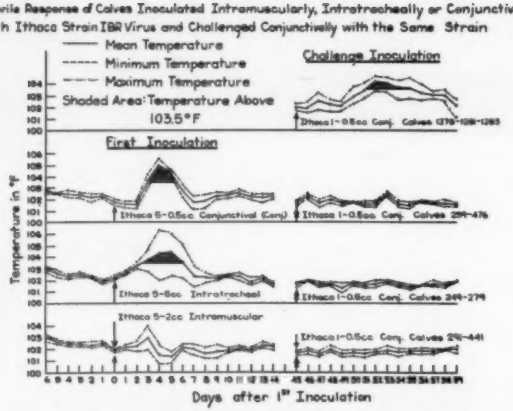
Febrile Response of Calves Inoculated Intramuscularly, Intratracheally or Conjunctivally with Ithaca Strain IBR Virus and Challenged Conjunctivally with the Same Strain
Mean Temperature
Minimum Temperature
Maximum Temperature
Shaded Area: Temperature Above 103.5°F
Challenge Inoculation
First Inoculation
Temperature in °F
Ithaca 6-0.5cc Conjunctival (Conj.)
Ithaca 1-0.5cc Conj. Calves 291-476
Ithaca 9-5cc Intratracheal
Ithaca 1-0.5cc Conj. Calves 249-279
Ithaca 5-2cc Intramuscular
Ithaca 1-0.5cc Conj. Calves 296-441
Days after 1st Inoculation

Chart 1.

normal calf sera, were added, giving final dilutions of virus from 10^{-1} to 10^{-5} and a serum dilution of 1:2. Following one hour incubation at 37 C. in the water bath, each serum-virus mixture was inoculated into two bovine kidney culture tubes in 0.2 ml. amounts. The tubes were read microscopically for seven days. Neutralization indexes were derived from the log difference of virus titers in presence of test and the non-immune serum. Virus end-point calculations were made by the Reed and Muench[5] formula. Prior to use in test, all sera were inactivated at 56 C. for 30 minutes.

Experimental

Reaction of Calves to Intramuscular, Intratracheal or Conjunctival Inoculation of IBR Virus (Ithaca Strain). Six milk breed calves, 275 to 350 lb. in weight, were divided into three groups of two. Animals of the first group were each inoculated intramuscularly with 2.0 ml. undiluted fifth passage virus ($10^{7.5}$ TC-ID_{50}); those of the second received 5.0 ml. of the same preparation ($10^{8.5}$ TC-ID_{50}), between two upper rings of the trachea, and those of the third 0.5 ml. ($10^{7.2}$ TC-ID_{50}) on the conjunctiva of the left eye. Temperature reactions during the first two weeks following inoculation are shown in chart 1 as mean, minimum, and maximum curves rather than individually. Somewhat unexpected was the practically complete lack of reaction to intramuscular inoculation, the highest reading being 104 F. for one day (third after inoculation) in one of the two animals. In contrast, however, both calves infected conjunctivally reacted for three to four days. Of those inoculated intratracheally only one exhibited a febrile response, the other maintaining a normal temperature throughout.

TABLE 1. Immune Response of Calves Inoculated with Fifth Passage Ithaca Strain IBR Virus Intramuscularly, Intratracheally, or Conjunctivally, and Challenged Conjunctivally with First Passage Ithaca Strain Virus.

Calf No.	Dose and Route Inoc.	Log. Neutralization Index: Days After Inoculation 0	7	14	31	45*	55	63
291	2.0 ml. U.T.C.F.[1] Intramuscularly	10^{0}	$10^{0.5}$	$10^{4.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$
441	($10^{7.5}$ TC-ID_{50})[2]	10^{0}	$10^{0.5}$	$10^{4.0}$	$10^{3.5}$	$10^{4.0}$	$10^{5.0}$	$10^{5.0}$
249	5.0 ml. U.T.C.F. Intranasally	10^{0}	$10^{1.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$
279	($10^{8.5}$ TC-ID_{50})	10^{0}	$10^{0.5}$	$10^{5.0}$	$10^{3.5}$	$10^{4.0}$	$10^{5.0}$	$10^{5.0}$
259	0.5 ml. U.T.C.F. Conjunctivally	10^{0}	$10^{0.5}$	$10^{3.5}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$
476	($10^{7.2}$ TC-ID_{50})	10^{0}	$10^{0.5}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$	$10^{5.0}$
1278	*Challenge Controls: 45th Day*					10^{0}	$10^{0.5}$	$10^{5.0}$
1281	0.5 ml. U.T.C.F. Conjunctivally					10^{0}	10^{0}	$10^{5.0}$
1283	($10^{8.5}$ TC-ID_{50})					10^{0}	$10^{1.5}$	$10^{5.0}$

[1]U.T.C.F. = Undiluted tissue culture fluid.
[2]($10^{7.5}$TC-ID_{50}) = 63,000,000 tissue culture infective doses 50.
*Day of challenge.

Some clear nasal discharge and watery eyes were present for three to six days in all animals which reacted thermally, and in the conjunctival group there was also hyperemia of the inoculated eye membranes, which lasted for three to six days. Because of the more pronounced over-all response in this latter group, the conjunctival route was selected for the challenge of the six animals 45 days following inoculation, together with three control calves, 150 to 175 lb. The challenge consisted of 0.5 ml. undiluted tissue culture fluid of first passage Ithaca strain ($10^{6.3}$ TC-ID_{50}) which was administered on the right conjunctiva. As shown in chart 1, temperatures of the previously inoculated animals remained normal, although they did exhibit a mild hyperemia of the right conjunctiva for a few days with watery discharge. The three controls, however, became febrile and developed nasal discharges, watery eyes, and conjunctivitis of the right eye for a period of six to nine days. One in particular developed an opaque area over the right cornea which lasted for several days, ulcerated and finally healed by the third to fourth week. Leukocyte counts were made daily on all nine animals. There was no leukopenia at any time, nor were consistent deviations from normal noted.

Blood specimens were obtained from the first six animals on the day of inoculation and 7, 14, 31, 45, 55 and 73 days thereafter. From the controls, they were taken on the day of challenge and ten and 18 days later. Results of the serum-neutralization test on these specimens are given in table 1. It seems that, regardless of the mildness or severity of reaction, animals of all groups developed antibodies to comparable levels, perhaps higher in the conjunctival group. Antibodies were still essentially absent seven days after inoculation but reached maximum levels by the 14th day and were maintained through at least 45 days. Titers were readily boosted after challenge and were of the same order in all animals.

Intramuscular Inoculation versus Intranasal Spray of IBR Virus (Ithaca Strain). The general lack of reaction observed in the previous experiment following intramuscular inoculation led to the question as to whether this apparent resistance could be overcome by a larger dose of virus. In addition, the relatively mild reactions which followed either intratracheal or conjunctival administration of the virus made it necessary to seek a more sensitive route of challenge. Consequently, exposure by a finely divided intranasal spray was investigated.

Nine milk breed animals, 600 to 875 lb., were divided into three groups of three. Calves of group 1 each received 2.0 ml. 11th passage Ithaca strain virus intramuscularly ($10^{7.8}$ TC-ID_{50}); those of group 2 received 10.0 ml. of the same preparation, also intramuscularly ($10^{8.0}$ TC-ID_{50}), and those of group 3, 4.0 ml. intranasally ($10^{7.6}$ TC-ID_{50}). Regardless of the dose given, febrile reactions were again essentially absent in groups 1 and 2, as shown in chart 2. In contrast, group 3 animals exposed intranasally, all developed high temperatures beginning on the third day and re-

Infectious bovine rhinotracheitis illustrating profuse, purulent, nasal discharge in an advanced case. Exudates extend throughout the upper respiratory tract and into the trachea.

Courtesy E. H. Scheel, D.V.M., Greeley, Colo.

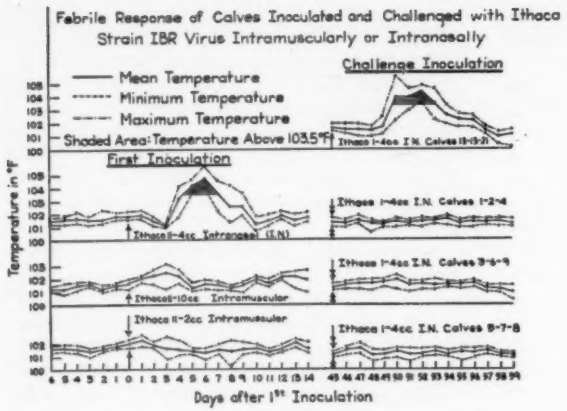
Febrile Response of Calves Inoculated and Challenged with Ithaca Strain IBR Virus Intramuscularly or Intranasally
Challenge Inoculation
Mean Temperature
Minimum Temperature
Maximum Temperature
Shaded Area: Temperature Above 103.5°F
First Inoculation
Temperature in °F
Days after 1st Inoculation

Chart 2.

turning to normal six to seven days later. These reactions were more severe than those observed in the intratracheal or conjunctival group of the previous experiment and were accompanied by nasal and eye discharges lasting three to five days, as well as by a mild conjunctivitis of either or both eyes. On the 45th day following inoculation the nine calves, together with three normal controls, were challenged by intranasal spray of 4 ml. first passage virus (Ithaca strain) ($10^{5.8}$ TC-ID_{50}). As indicated in chart 2, previously inoculated animals remained normal, whereas the three control calves developed typical high temperatures, with nasal and eye discharges. Table 2 summarizes results of the serum-neutralization test on blood specimens obtained from the animals at various intervals following first and second inoculations. Again it can be observed that neutralizing antibodies were readily detected on the 14th day following inoculation or challenge and did not vary greatly in their levels. Although it seemed as if IBR antibodies decreased at a faster rate in some of the animals receiving the 2 ml. intramuscular injection than in the other two groups, the difference was not reflected in the ability of all calves to withstand a severe form of challenge.

Intramuscular Inoculation versus Intranasal Spray of IBR Virus (Blythe Strain). Having established that the intramuscular inoculation of Ithaca strain virus to susceptible calves gave rise to no undue reaction even with 10.0 ml. doses, the response of animals to a different isolate of IBR virus by the same route of inoculation was investigated.

Undiluted tissue culture fluid, representing the 15th serial passage in bovine kidney of the Blythe strain virus, was dried from the frozen state. On the day of calf inoculation, it was reconstituted to the original volume in

TABLE 2. Immune Response of Calves Inoculated with 11th Passage Ithaca Strain IBR Virus Intramuscularly or Intranasally, and Challenged Intranasally with First Passage Ithaca Strain Virus.

Calf No.	Dose and Route of Inoculation	Log. Neutralization Index: Days after Inoculation 0	7	14	31	38	44*	52	59
5	2.0 ml. U.T.C.F.[1]	10°	$10^{0.5}$	$10^{3.0}$	$10^{3.5}$	$10^{3.5}$	$10^{3.0}$	$10^{5.5}$	$10^{5.5}$
7	Intramuscularly	10°	$10^{1.0}$	$10^{5.0}$	$10^{5.5}$	$10^{3.5}$	$10^{5.0}$	$10^{5.5}$	$10^{5.5}$
8	($10^{7.3}$ TC-ID_{50})[2]	10°	$10^{1.0}$	$10^{5.0}$	$10^{3.5}$	$10^{3.5}$	$10^{2.0}$	$10^{4.0}$	$10^{5.0}$
3	10.0 ml. U.T.C.F.	10°	10°	$10^{4.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$
6	Intramuscularly	10°	10°	$10^{4.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$
9	($10^{8.0}$ TC-ID_{50})	10°	$10^{0.5}$	$10^{5.0}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$
1	4.0 ml. U.T.C.F.	10°	10°	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$
2	Intranasally	10°	10°	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$
4	($10^{7.6}$ TC-ID_{50})	10°	10°	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$
12	Challenge Controls: 45th Day						10°	$10^{1.0}$	$10^{5.5}$
13	4.0 ml. U.T.C.F. Intranasally						10°	10°	$10^{5.5}$
21	($10^{5.8}$ TC-ID_{50})						10°	$10^{5.5}$	$10^{5.5}$

[1,2]For explanation of symbols see table 1.
*Day preceding challenge.

sterile distilled water and administered as follows: Eight calves of the Hereford breed, 700 to 900 lb. in weight, were divided into two groups of four. Animals of the first group were each inoculated intramuscularly with 2.0 ml. ($10^{6.0}$ TC-ID_{50}) of the reconstituted preparation, and those of the second were sprayed intranasally with 4.0 ml. ($10^{6.3}$ TC-ID_{50}). The temperature curves of group 1, shown in chart 3, were in every respect similar to those obtained after infection with Ithaca strain; whereas the animals inoculated intramuscularly had only minimal or no reactions whatever, all those of the intranasally infected group responded with rather high temperatures for about eight to nine days. Challenge of these animals and of three controls took place 21 days after inoculation. It was carried out intranasally, each calf receiving 4.0 ml. of the second passage Ithaca strain ($10^{6.3}$ TC-ID_{50}). It can be seen from chart 3 that only control animals, and all three of them, gave the febrile response, characteristic of IBR, indicating the immunologic identity of the Ithaca and Blythe strains of IBR virus.

Table 3 summarizes the results of the serum-neutralization test: All animals were devoid of neutralizing antibodies on the day of inoculation, but were all positive 16 days later. The intramuscular group had lower antibody levels than the intranasal, but they were both found equally resistant to challenge.

Discussion

The data reported here, as well as that of other yet unpublished experiments, indicate that IBR can readily be transmitted to susceptible cattle by any of three routes of inoculation: Intratracheal, conjunctival, or intranasal. The latter, however, seems to be the most consistent in affecting all exposed animals and in producing the most severe reactions. As a rule, the experimental disease is followed by prompt recovery. The appetite is not seriously impaired. There is no appreciable loss of condition and the leukocyte count remains within normal limits. Other signs of disease such as nasal and eye discharges, are generally mild, last only a few days and vary from one animal to another. Fever is the most pronounced and constant feature and constitutes the most reliable proof of successful transmission.

In a small proportion of experimental animals, the disease may take a chronic form, with loss of appetite and condition; but these cases respond quite promptly to treatment with a broad-spectrum antibiotic, indicating a probable secondary bacterial infection. In no instance, however, was the severity of the disease similar to advanced cases sometimes observed in the field, suggesting that the morbid condition of these cases may be due to complicating factors, bacterial or otherwise.

The lack of untoward reaction, the high antibody level and solid resistance to challenge which follow intramuscular injection suggest that the live virus may well be used by that route as a vaccine, even though it is still capable of causing symptoms when inoculated intranasally. Should it be demonstrated serologically and by actual challenge that when given intramuscularly the virus fails to spread to contact animals, there should be no serious

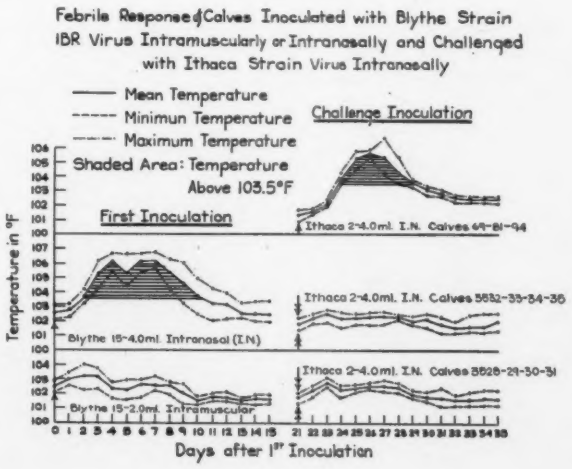
Febrile Response of Calves Inoculated with Blythe Strain IBR Virus Intramuscularly or Intranasally and Challenged with Ithaca Strain Virus Intranasally
Mean Temperature
Minimun Temperature
Maximum Temperature
Shaded Area: Temperature Above 103.5°F
Challenge Inoculation
First Inoculation
Ithaca 2-4.0ml. I.N. Calves 69-81-94
Ithaca 2-4.0ml. I.N. Calves 5832-33-34-36
Blythe 15-4.0ml. Intranasal (I.N.)
Ithaca 2-4.0ml. I.N. Calves 3828-29-30-31
Blythe 15-2.0ml. Intramuscular
Temperature in °F
Days after 1st Inoculation

Chart 3.

TABLE 3. Immune Response of Calves Inoculated with 15th Passage Blythe Strain IBR Virus Intramuscularly or Intranasally, and Challenged Intranasally with Second Passage Ithaca Strain Virus.

	Dose and Route of Inoculation: Calf No.										
Log Neutralization Index:	2.0 ml. U.T.C.F.[1] Intramuscular ($10^{6.0}$ TC-ID_{50})[2]				4.0 ml. U.T.C.F. Intranasal ($10^{6.3}$ TC-ID_{50})				Challenge Controls: 21st Day 4.0 ml. U.T.C.F. Intranasal ($10^{6.8}$ TC-ID_{50})		
	3528	3529	3530	3531	3532	3533	3534	3535	69	81	94
Days After Inoculation											
0	10^{0}	10^{0}	10^{0}	10^{0}	10^{0}	10^{0}	10^{0}	10^{0}	—	—	—
16*	$10^{5.5}$	$10^{5.5}$	$10^{5.0}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	10^{0}	10^{0}	10^{0}
36	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{4.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{5.5}$	$10^{4.5}$

[1,2]For explanation of symbols see table 1.
*5 days before challenge.

objection to the use of this method for the immunization of cattle in the field. Such an investigation is underway.

Summary

Infectious bovine rhinotracheitis was successfully transmitted to susceptible cattle when tissue culture grown virus was administered intratracheally, conjunctivally, or intranasally. When finely divided virus was sprayed by this latter route, thermal responses were most consistent and uniform. The experimental disease was generally mild and complete recovery the rule. Intramuscular inoculation of large doses of virus was followed by minimal or no reaction what-so-ever, but animals so injected developed appreciable levels of antibodies and resisted a severe form of challenge. The implications of this latter finding, with regard to the immunization of field animals, was discussed.

Acknowledgement

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▼ ▼ ▼

Increased Number of Agents Toxic to Livestock

"Livestock are being increasingly exposed to poisoning by a greater variety of toxic agents as our modern technology expands," states Dr. G. Townley Price in *The Oklahoma Veterinarian*, June 1957.

The toxic plants peculiar to various regions and the occasional carelessly discarded paint bucket that formerly were responsible for most cases of livestock poisoning have given way to modern agricultural practices. A vast array of insecticides, fungicides, herbicides, preservatives, et cetera — complex chemical compounds useful in modern day farm operation — are now commonplace. Many of these are toxic for livestock unless extreme care is taken in their use and application. In addition, industrial effuents, oil pipe line operations, and other non-farm operations located in rural areas have potential hazard.

Toxicity of some compounds to which animals are sometimes exposed is not apparent until losses occur. Fresh in memory is the toxicity of chlorinated naphthalenes in lubricants and finally evidence of their disease producing capability.

The toxicologist and toxicological examination are essential in the definitive diagnosis of many livestock ailments. These examinations are complex, exhaustive, and time consuming. History and specimens to be submitted to the laboratory must be selected with care and handled properly to assure good results. The toxiocologist's place in the diagnostic laboratory staff is a most important one today.

Abortion Of Fetuses Exhibiting Evidence Of Dwarfism

F. M. BOLIN,* D.V.M., M. L. BUCHANAN,* M.S., R. F. SHUMARD,* Ph.D., and D. F. EVELETH,* Ph.D., D.V.M., Fargo, North Dakota

ABORTIONS or the delivery of calves at term that die within a 24-hour period after birth are becoming frequent occurrences in some cattle herds. In some cases tests have been made for evidence of brucellosis, leptospirosis, vibriosis, trichomoniasis, and listeriosis with negative findings in all tests. When it became apparent that usual causes of abortion could not be demonstrated, more thorough examinations for physiological causes of death were instituted.

It has been observed that many fetuses submitted for examination have a shorter than normal upper jaw thus giving the appearance of an extended under jaw. In most cases nearly all parts of the body are edematous; the condition being more profuse in the ventral portion of the throat area and extending into the muscular areas. A hydrothorax and ascites may develop in some instances.

In most of these cases a spheroid heart[1] has been found. This condition, together with closed occipital condyles, and abnormal lumbar vertebrae[2] which are indicative of dwarfism, do not always occur in the same individual.

A case report can be used to illustrate some of our findings. On January 27, 1957, the owner of a herd of registered Angus cattle presented a five to six month old fetus for diagnosis. He gave a history of the same cow aborting a fetus of about the same size the previous year.

The fetus was diagnosed a dwarf from heart shape, closed occipital condyles, and general conformation. The cow sickened soon after abortion. This animal was brought into our laboratory and died two days later. Postmortem examination revealed a typical spheroid heart, closed occipital condyles, and abnormal adrenal glands. (Fig. 1, 2, and 3.)

Both the fetus and the dam showed evidence of edema, hydrothorax, and ascites. In both instances the gross pathology was suggestive of cardiac insufficiency. This cow and the sire of the dwarf calf were both known carriers of dwarfism, but both were of normal size for the breed.

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Fig. 1. Left: Pairs of adrenal glands from dwarf carrier cow. Adrenal (l.) of dwarf carrier is atrophied; note deposits of melanin in the capsular area (r). Right: Bisected appearance of same adrenal glands. There is no gross indication of a functional cortical area in either gland. Note large areas of hemorrhagic necrosis (l.) and central medullary cavity (r.). Melanin deposits appear at periphery of the right gland.

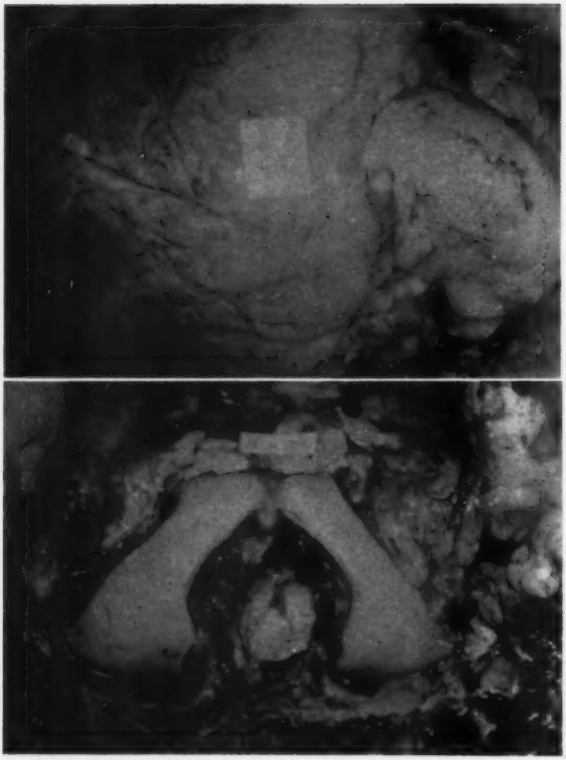

Fig. 2. Illustrating spheroid shaped heart removed from dwarf carrier cow (top); closed occipital condyles of dwarf carrier cow (bottom).

These observations indicate that dwarfism associated with cardiac insufficiency may not be unusual in herds where dwarfism is a problem.

As more data are obtained from examination of aborted fetuses, it becomes apparent that bone deformations and spheroid shaped hearts are often associated with abortions and either stillborn calves or calves that die shortly after birth.

A careful differential diagnosis should always be made before ascribing the deaths of calves to dwarfism. One should eliminate possible infections, but at the same time remember the abnormal anatomy observed at autopsy.

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For every 1/10 in. less fatback, a pig will use 4½ lb. less feed per 100 lb. gain.

Cancer Etiology

It seems to the writer that a virus — specificity largely unknown at this time — is receiving more consideration as an etiological factor in the formation or production of at least some types of human and animal malignancies. In animals for example, the viral cause has been established in chickens in forms of leukemia, sarcomas, and lymphomatosis. Experimentally, an agent presumably in the milk of mice, has been found to be a transmitter that later resulted in malignant tumor formation in the nursing young. More recently, a number of convicts in a state penitentiary offered to be submitted to inoculations of malignant cells with the result, according to the daily press, that in some of these individuals the cells grew, and in others they failed to develop. The tentative interpretation is that those in which the cells grew were susceptibles, the others immunes. With these established and preliminary results the concept of viral etiology of some of the various malignancies and related ailments appears to be attaining more and more momentum.—*R. R. Dykstra, D.V.M.*

Critical Test Of The Efficacy Of *n*-Butyl Chloride As An Anthelmintic In Cattle†

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ALTHOUGH phenothiazine is commonly regarded as the drug of choice for the treatment and control of parasitic nematodes of cattle, it has relatively little effect on the intestinal nematodes, Cooperia spp., and is rather variable in its effect on the medium stomach worm, *Ostertagia ostertagi*. Although repeated critical tests[2,3,5] have shown that the drug is 100% effective against the stomach worms of the species *Haemonchus contortus* and *Trichostrongylus axei*, there have been scattered reports of its failure to control trichostrongylosis in calves.

Recently, interest in the use of *n*-butyl chloride as an anthelmintic in cattle has received impetus from a paper by Turk,[6] wherein that author recommended the use of this drug for animals which do not respond to phenothiazine therapy. In his experience, animals so treated evinced a good clinical response.

Wright and Schaffer[7] found that *n*-butyl chloride removed 98 and 84%, respectively, of the ascarids and hookworms from 21 dogs. There was no evidence of toxic effects other than a slight fatty change in the liver. Harwood *et al.*[1] showed that this drug was highly effective against cylicostomes, as well as against Strongylus spp. in horses. Treatment with ten times the therapeutic dose resulted in the death of two animals.

Heretofore the drug has not been studied critically in cattle. Critical tests on the efficacy of a closely related compound, *n*-butylidene chloride, indicated that the latter was not an effective anthelmintic for the gastrointestinal parasites of cattle.[8]

In view of these facts, we decided to determine critically the effects of *n*-butyl chloride in cattle.

Procedure

The experiment was conducted in the manner described by Swanson *et al.*[5] The animals used were 8- to 19-month-old calves which had grazed on pastures near this laboratory after having been used in studies on coccidiosis and helminthiasis. None of the animals had shown symptoms of worm parasitism, and the fecal egg counts on them were low; less than 200 eggs per gram (EPG) of feces, except for calf 1407, which had a count in excess of 800 EPG.

As recommended by Turk,[6] *n*-butyl chloride was mixed with two volumes of mineral oil and delivered at a rate of 10 ml. of drug per hundredweight, with a maximum of 40 ml. As summarized in table 1, two animals each received 60 gm. of phenothiazine by drench followed immediately by the administration of *n*-butyl chloride, two other animals received only *n*-butyl chloride, and two were given *n*-butyl chloride 15 sec. after the administration of 60 ml. of a 10% solution of sodium bicarbonate to stimulate closure of the esophageal groove.[4]

Results and Discussion

Table 1 shows the number and species of worms expelled in the feces and the number and species recovered from each animal at autopsy.

No worms were found in the feces of the two animals treated with *n*-butyl chloride alone. Of the two which were given sodium bicarbonate solution prior to *n*-butyl chloride, one expelled all the *H. contortus* it harbored at time of treatment, but none of the *O. ostertagi*, while the other animal expelled only 26 of 219 *H. contortus* and 183 of 743 *O. ostertagi*. No other species of nematodes were recovered from the feces, apparently having been unaffected by the drug. Postmortem recovery of *Moniezia benedeni* from these two indicated that the drug had no effect on this cestode.

It appears from the foregoing that closure of the esophageal groove is essential for the manifestation of an anthelmintic effect by *n*-butyl chloride.

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As the species and numbers of worms removed by the administration of phenothiazine and *n*-butyl chloride were similar to the results obtained by the administration of phenothiazine alone,[2,3,8] and inasmuch as *n*-butyl chloride so poorly and erratically affected only two species of nematodes in these limited trials, the latter can not be considered an effective anthelmintic in cattle under the experimental conditions herein described.

Summary

The efficacy of *n*-butyl chloride was tested as an anthelmintic in cattle. Administered with phenothiazine, the *n*-butyl chloride did not result in any increased efficiency over previously recorded efficacies for phenothiazine alone. *n*-Butyl chloride was completely ineffective unless closure of the esophageal groove was effected prior to the administration of the drug. Following such closure, it was unsatisfactory as an anthelmintic in critical tests in cattle.

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Associated Press dispatch under dateline Berlin, May 11, advises that "the entire third-year class of the Veterinary College of East Berlin's Humboldt University, were described here as staging this week the biggest open strike against East Germany's Red regime since the workers' uprising of 1953."

TABLE 1. The Efficacy of *N*-Butyl Chloride in Cattle

Animal No.	Weight (lb.)	Treatment Drug	Dosage	Worms eliminated following treatment H.c.*	O.o.*	T.a.*	T.c.*	C.p.*	O.r.*	M.b.*
1316	385	Pheno.*	60 gm.							
		n-Butyl cl.*	38.5 ml.	0	1,028	1,028	0	0	0	0
1334	430	Pheno	60 gm.							
		n-Butyl cl.	40 ml.	0	404	405	0	0	6	0
1326	585	*n*-Butyl cl.	40 ml.	0	0	0	0	0	0	0
1335	340	*n*-Butyl cl.	34 ml.	0	0	0	0	0	0	0
1404	355	*n*-Butyl cl.**	35.5 ml.	9	0	0	0	0	0	0
1407	285	*n*-Butyl cl.**	28.5 ml.	26	183	0	0	0	0	0
				Worms Recovered at Necropsy 5 Days after Treatment						
1316				0	200	0	0	0	0	0
1334				0	40	0	0	70	0	0
1326				123	5,560	920	400	1,450	72	0
1335				47	6,440	1,130	60	60	132	0
1404				0	240	600	0	23,000	359	1
1407				193	560	0	0	9,960	154	16
				Percentage of Efficacy						
1316				—	83.7	100	—	—	—	—
1334				—	90.9	100	—	0	100	—
1326				0	0	0	0	0	0	—
1335				0	0	0	0	0	0	—
1404				100	0	0	—	0	0	0
1407				11.9	24.6	—	—	0	0	0

*H.c. = *Haemonchus contortus;* O.o. = *Ostertagia ostertagi;* T.a. = *Trichostrongylus axei;* T.c. = *T. colubriformis;* C.P. = *Cooperia punctata;* O.r. = *Oesophagostomum radiatum;* M.b. = *Moniezia benedeni;* Pheno. = Phenothiazine; *n*-Butyl cl. = *n*-Butyl chloride.

**Preceded by administration of sodium bicarbonate.

Newer Treatments For Helminthic Infections†

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PART II
Sheep and Goats

Lungworms. In trials by Durbin,[35] emetine hydrochloride appeared to be a reasonably safe and effective treatment against *Protostrongylus rufescens* and *Muellerius capillaris* in sheep and *M. capillaris* in goats. A 1 % aqueous solution of the chemical was given intramuscularly at the rate of 0.15 cc. per pound of body weight followed by a second injection two days later. The treatment appeared to be well tolerated, although one animal lost its wool within two weeks after medication.

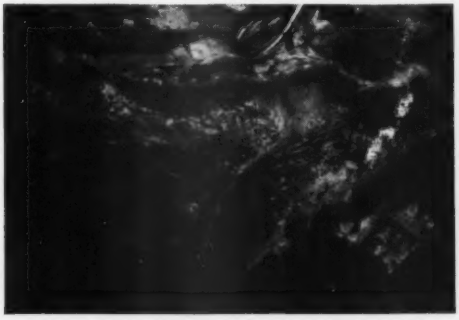
The treatment was ineffective against *Dictyocaulus filaria* in recent trials with two sheep at the Agricultural Research Center, and one of the two animals died on the second day after medication. Death was not definitely attributable to the chemical, however, because the lamb was heavily infected with gastrointestinal parasites and had extensive lesions of pneumonia. It may be significant that the wool of this animal broke off cleanly at the skin surface under slight traction, although this phenomonon has been observed also in lambs with experimental coccidial infections.

Tapeworms. Lead arsenate, as noted by Foster and Habermann,[36] is a safe and effective treatment for removing the common tapeworm, *Moniezia expansa,* from sheep although the undesirability of the lead component of the chemical has long been recognized. In recent investigations[37] at the Agricultural Research Center, however, it has been demonstrated that the teniacidal action of lead arsenate is not dependent upon this objectionable element. In preliminary trials, the arsenates of calcium, cobalt, copper, and iron (-ic) were well tolerated and completely effective in removing this parasite from lambs. The chemicals were given in gelatin capsules without preliminary fasting, in doses of 0.5 gm. per animal. The lambs were autopsied two weeks after treatment, a holding period designed to permit partial restrobilation of scolices unaffected by the drugs. Because the data are limited, additional trials, including further studies on toxicity, must be made before any of these chemicals can be recommended for other than experimental use. In this connection, however, the dosages of the various compounds may properly be calculated on the basis of arsenic content in view of the aforementioned findings regarding teniacidal action.

Dichlorophen, also known as teniatol®[1] and di-phenthane-70, was reported to be effective against the common and fringed tapeworms of sheep, *M. expansa* and *Thysanosoma actinioides,* respectively, in trials reported by Ryff and coworkers[38,39] in 1949 and 1950. According to these investigators, a dosage of 0.04 gm. per pound of body weight was sufficient to remove the common species and 0.4 gm. per pound was effective against the fringed tapeworm. Subsequent reports by Olsen,[40] Allen and Jackson,[41] and Price and Hardy[42] on the

In this article, the second in a series of three on the changing concepts of helminthic parasite control to be reported in VETERINARY MEDICINE (52:267 [Jun.] 1957), the authors present comparative data on critical tests conducted with newer agents. This series will be concluded with a discussion of helminthic infection control in small animals in the August issue.

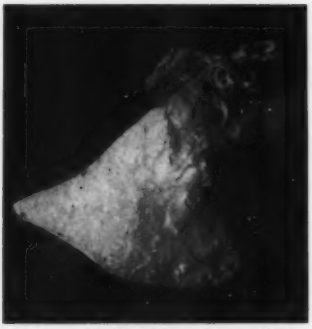
®[1]Pitman-Moore Company, Indianapolis, Ind.



Illustrating lungworms in opened bronchi and excess mucus (sheep).

†A revision of a paper presented by the senior author at the Symposium on Helminthic Problems in Veterinary Medicine (1955), School of Veterinary Medicine, University of Pennsylvania.

*Parasite Treatment Section, Animal Disease and Parasite Research Division, Agricultural Research Service, Agricultural Research Center, U. S. Department of Agriculture.



Section of lung with lungworms in small bronchiole (sheep).

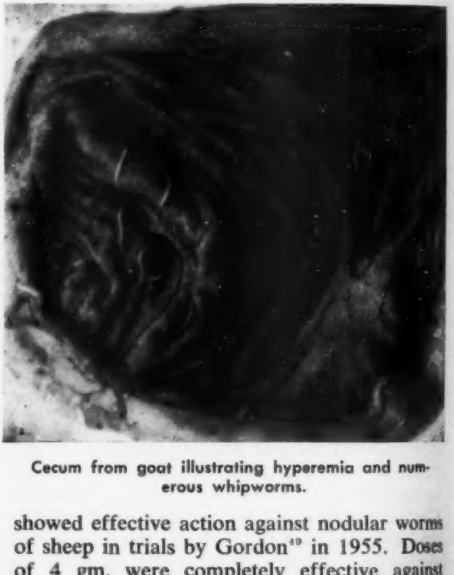
use of the chemical against the fringed tapeworm indicate, however, that the safety, efficacy, and economic feasibility of the treatment have not been adequately established. Moreover, following trials with the drug by Enzie, Foster, Sinclair, and Colglazier,[43] it was concluded that dichlorophen was not as reliable as other available teniacides for the removal of Moniezia.

Filaria. Diethylcarbamazine has been found[44] to be an effective treatment for the control of filarial dermatosis caused by the migrating larvae of *Elaeophora schneideri.* In preliminary trials, dosages of 18 to 25 mg. per pound of body weight, given by mouth, were apparently well tolerated and caused remission of lesions within a week after the completion of a 15-day course of treatment. The remedy is somewhat costlier, however, than the regimen employing tartar emetic and glucose solution, described by Kemper and Roberts,[45] which consists of six to eight weekly or semi-weekly intramuscular injections of 30 cc. each.

Abdominal Worms. In limited trials by Shoho[14] in Japan and Pillai and Perera[46] in Ceylon, diethylcarbamazine was effective in controlling *Setaria digitata,* the migrating larvae of which produce epizootic cerebrospinal nematodiasis of sheep and goats. In therapeutic trials, the chemical was given to sheep and goats at a dose rate of 40 mg. per kilogram of body weight for one to three days. Nervous symptoms, including posterior paralysis, generally disappeared within a few days; and there were no indications of toxicity attributable to the drug. The chemical showed promise of effective prophylactic action in sheep although the conditions under which trials were made do not permit definitive interpretations of the results.

Miscellaneous Parasites. Trials by Olsen and Wade[47] in 1950 showed that the hexachloroethane-bentonite suspension for the removal of the common liver fluke, *Fasciola hepatica,* from sheep[48] is also effective against the large stomach worm, *Haemonchus contortus.* Doses of 60 cc. of the suspension, containing 0.3 gm. of the drug per pound of body weight, destroyed all *H. contortus* in five sheep. The suspension was ineffective against other gastrointestinal nematodes in these animals, however. It was not uniformly effective against any of the common gastrointestinal nematodes of goats. The findings in sheep are of particular interest because Haemonchus often occurs concurrently with liver flukes; and fasciolicidal doses of carbon tetrachloride, the alternative treatment for Fasciola, are not effective against Haemonchus. Moreover, the rumen fluke, Paramphistomum sp., is also destroyed by fasciolicidal doses of hexachloroethane.

Piperazine hydrate, piperazine diacetate, and betaine of 1-piperazine carbodithioic acid



Cecum from goat illustrating hyperemia and numerous whipworms.

showed effective action against nodular worms of sheep in trials by Gordon[49] in 1955. Doses of 4 gm. were completely effective against *Oesophagostomum columbianum* and *O. venulosum* in all of 12 sheep, but showed no anthelmintic action against Haemonchus, Trichostrongylus, and Chabertia. Indeed, doses up to 25 gm. of piperazine hydrate were ineffective against Trichostrongylus spp. Similar results were obtained with piperazine adipate in limited trials at the Agricultural Research Center. The chemical, given at the rate of 200 mg. per pound of body weight, removed all of 164 nodular worms from one lamb; and a dosage of 100 mg. per pound of body weight removed

99% of 299 nodular worms from one goat. The drug was ineffective against other nematode species in both hosts.

In 1956, Marquardt and Fritts[50] reported that piperazine hexahydrate and piperazine glycolylarsanilate were ineffective against Nematodirus, Strongyloides, Trichuris, and trichostrongyles (presumably, Haemonchus and Trichostrongylus) in sheep. Moreover, animals that received piperazine glycolylarsanilate were apparently off feed for several days and three of ten animals died within a week after treatment.

Swine

Large Roundworms. Cadmium oxide was first described as an ascaricide for swine by Bunde, Blair, Burch, and Lee[51] in 1954, and a complete account of their findings was published by Burch and Blair[52] the following year. The optimum regimen of medication consists in giving the chemical for three consecutive days at a concentration of 0.015% of the feed. In critical trials this regimen removed 98% of 60 ascarids from 14 pigs; and marked ascaricidal action was exhibited also in a number of field trials.

Feed mixtures containing 0.015% cadmium oxide were palatable and well tolerated, and specific trials with various types of feeds showed that the chemical may be given in either wet or dry mixtures. At concentrations of 0.03% and higher, however, feed consumption diminished and there was evidence of vomition and diarrhea.

Tissue analyses of pigs after treatment with 0.015% cadmium oxide for three days showed the highest concentrations of the chemical in the liver, kidney, and spleen. The cadmium content of these tissues was ten parts per million on the day after treatment, but the amounts were said to "approach normal limits" in animals slaughtered 30 days after medication.

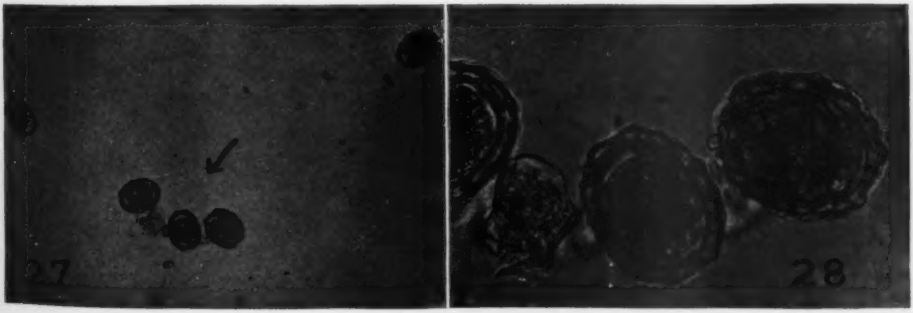
In critical tests involving 30 pigs infected experimentally with *Ascaris lumbricoides,* Enzie and Colglazier[53] found that in recommended doses the treatment removed 91% of 607 ascarids from 19 to 23 pigs. It was not possible to determine the precise number of infected animals because the pigs were usually treated in pairs and approximately half of the trials were conducted before patency of the experimental infections was established. There was no indication that the ascaricidal action varied with the age of the infection.

The first report on the ascaricidal action of cadmium anthranilate in swine was published by Guthrie[54] in 1954. Observations in critical trials indicated that the most consistent results were obtained when the chemical was given for three consecutive days at a concentration of 0.066% of the regular ration. This mixture was consumed readily and no evidence of intoxication was observed in any of the test animals. The regimen removed 98% of 292 ascarids from 12 pigs.

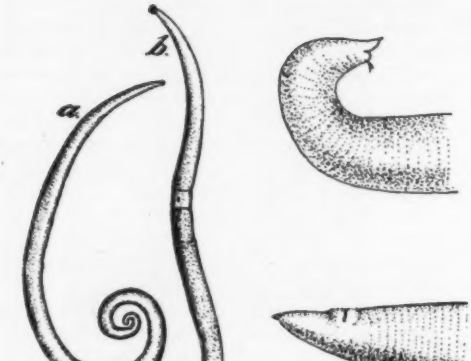
Feed containing large concentrations of cadmium anthranilate were promptly vomited, and on this account it was not possible to determine the acute toxicity of the chemical. No evidence of toxicity occurred, however, in one pig that was given 0.66% cadmium anthranilate in the feed for four consecutive days, indicating a therapeutic index of at least 10.

Tissue analyses showed that small amounts of cadmium were retained in the kidney, liver, spleen, and lungs of treated swine although the amounts that remained after thirty days were insignificant. Cadmium was not found in muscle tissue at any time, even in animals that were given therapeutic concentrations of the chemical daily for more than six weeks.

One month after the initial report, Guthrie[55] published the results of further trials with cad-



Ova of *Ascaris lumbricoides,* the common roundworm of swine (left); enlarged 400 times (right). Eggs are yellow.—Benbrook.



Illustrating adult *Ascaris lumbricoides* (left) four-ninths natural size, (a) male, (b) female.—From Neveu-Lemaire; tail of *A. lumbricoides* (top) male tail, lateral view, enlarged; (bottom) female tail, lateral view, enlarged.—From Neumann, after Leuckart.

mium anthranilate which showed that the ascaricidal action of the chemical was not materially impaired when the concentration was reduced to 0.044%. Administered at this level for three consecutive days, the drug removed 93% of 912 ascarids from 54 pigs. This lower concentration is the one recommended for general use.

In critical trials by Enzie and Colglazier,[58] a 0.044% cadmium anthranilate ration for three days removed 81% of 101 ascarids from nine pigs. Two additional pigs showed ascarid eggs on fecal examination before treatment, but no worms were recovered in the feces and none were found at autopsy.

Ascarids and Nodular Worms. Piperazine adipate,[7,53,56] betaine of 1-piperazine carbodithioic acid,[56,57,58,59] piperazine hexahydrate,[53,60] and piperazine sulfate[60] show unusual promise as generally useful anthelmintics for swine. They are active against nodular worms as well as against both mature and immature ascarids; they have a wide margin of safety for the host; and they present virtually no hazard to man either in themselves or as residual deposits in edible tissues. Published reports of critical trials, [53,57,58,59,60] as well as additional unpublished data obtained at the Agricultural Research Center, show that the piperazines are of unquestionable merit for the removal of ascarids and nodular worms from individually treated swine. In these trials, therapeutic dosages of the several piperazine derivatives removed, in the aggregate, 96% of 1,405 ascarids from 70 pigs and 99% of 6,866 nodular worms from 12 pigs. Little critical data appear to have been obtained, however, on the performance of various piperazines when given to groups of pigs. In this connection, it may be noted that in limited trials by Leiper[57] efficacy against both ascarids and nodular worms was lower in group trials than in animals treated individually, and data obtained at the Agricultural Research Center tend to support these findings. In critical trials with 12 groups of two to four animals each, therapeutic dosages of piperazine adipate or betaine of 1-piperazine carbodithioic acid removed, in aggregate, only 65% of 869 ascarids from 39 pigs and 69% of 27,797 nodular worms from 36 pigs. The percentage efficacy with respect to ascarids is undoubtedly conservative, however, because in two groups of pigs undetermined numbers of these worms were eaten by the animals before they could be collected. Nevertheless, it is significant that a total of 298 ascarids were recovered from 17 of the 39 pigs at autopsy. Although the available data are not conclusive, they suggest the need for a critical appraisal of the efficacy of piperazine derivatives given to swine under conditions that obtain in the field.

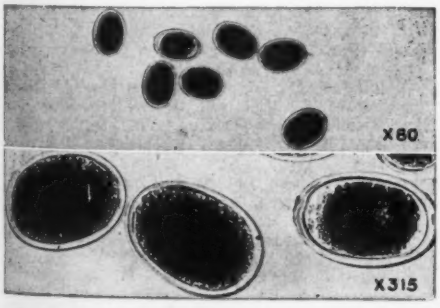
The piperazines may be given conveniently in the feed or drinking water; but dosages are calculated on the basis of body weight and, presumably, must be consumed within a reasonably short period. Hence, in group treatments, the more vigorous and probably less heavily parasitized animals may obtain a disproportionate share of highly palatable medicated feed or water. Moreover, the general practice of withholding feed or water for several hours before giving the appropriate dose of these drugs in limited amounts of feed or water may tend to increase the hazard of in-

adequate dosing of all animals within a group. On the other hand, medicated mixtures or solutions that are unpalatable to a greater or lesser degree tend to discourage consumption and contribute similarly to inadequate dosing. Marked differences in water consumption in consequence of variations in the atmospheric temperature throughout the year contribute further to the problem of proper dosing with medicated drinking water.

Poultry

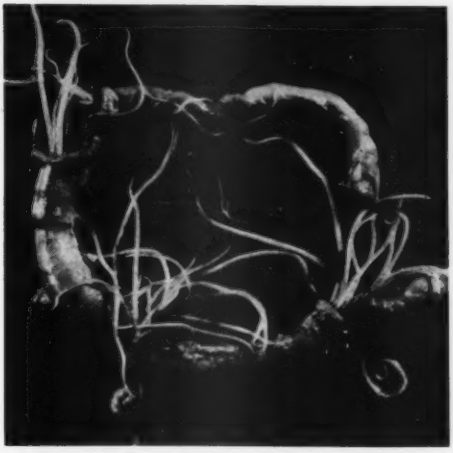
Tapeworms. Di-n-butyl tin dilaurate, a tetravalent tin compound called Butynorate, has been shown by Kerr[61] to be a safe and effective treatment for the removal of cestodes of the genus Raillietina from chickens. The minimal effective dosage (arbitrarily designated by Kerr as approximately 85%) is about 75 mg. per kilogram of body weight. Butynorate has an indicated therapeutic index of approximately 20 as compared with seven for the previous treatment of choice, hexachlorophene. Moreover, unlike the latter drug, butynorate does not adversely affect egg production. The chemical is fully compatible with nicotine and phenothiazine and is generally given to birds in combination with these drugs in the feed. Such a mixture is at once effective against large roundworms, cecal worms, and tapeworms of the genus Raillietina.

Large Roundworms. Piperazine adipate exhibited marked anthelmintic action against the large roundworm, *Ascaridia galli,* in trials reported by Sloan, Kingsbury, and Jolly[7] in 1954. The chemical was given in single doses or in various feed mixtures at dose rates ranging from 100 to 440 mg. per kilogram body weight. In the aggregate, the drug removed 97% of 1,585 Ascaridia from 70 birds, and at least 96% of the worms were removed in all trials involving dosages of 150 mg., or more, per kilogram body weight. Additional trials with laying hens showed that the treatment did not adversely affect egg production. Moreover, in specific toxicity trials, no unfavorable reactions were noted in birds that were given 1,000 mg. per kilogram body weight. Lethargy, transient inappetence, and scouring were noted in chickens that received 2,000 mg. per kilogram, but all birds were apparently normal 24 hours after treatment.



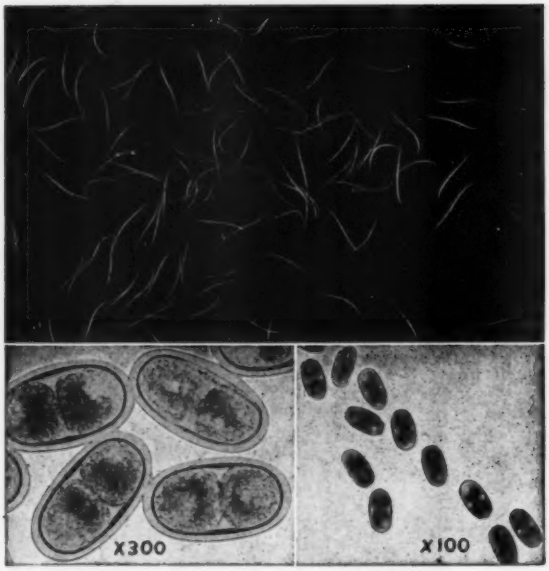
Courtesy Illinois Univ. Dept. Vet. Res., Cir. 698.

Ova of *Ascaridia galli,* common large roundworm of poultry, at two magnifications as indicated.



Intestine of a six-month-old chicken suffering from nutritional deficiencies and heavy infection of large roundworm, *A. galli.*

Piperazine citrate, in preliminary trials described by Shumard and Eveleth[62] in May 1955, exhibited marked anthelmintic action against the large roundworm, *A. galli,* but was somewhat less effective against the cecal worm, *Heterakis gallinae.* The chemical was given to 12 hens for one to four days at the rate of 8 gm. per gallon of drinking water and to one hen at the rate of 16 gm. per gallon for four days. Fecal examinations before treatment showed that all of the hens were infected with large roundworms and cecal worms. No attempt was made to recover worms in the feces after treatment; but Ascaridia were not found in any of the medicated birds when autopsied on the seventh day. Eight Ascaridia were found in one of two control birds. The treatment was not uniformly effective against cecal worms. In a field trial, the chemical appeared to be completely effective against Ascaridia when given at the rate of 10 gm. per gallon of drinking water for three days but was not effective against cecal worms. The drug was apparently well tolerated in all cases although there was the suggestion of a temporary, deleterious effect on egg production in the field trial.



Adult worm (natural size), *Heterakis gallinae*, cecal worm of fowl. Magnification as indicated for ova.

Courtesy Illinois Univ. Dept. Vet. Res., Cir. 698.

About five months later, Bradley[63] reported marked ascaricidal action in 8,900 six-week-old broilers that were given the chemical at the rate of 6 gm. per gallon of drinking water for 24 hours. The treatment was well tolerated in all respects.

Antibiotics (penicillin, neomycin, and streptomycin), according to the results obtained in trials by Todd,[64] reduced the growth rate of *A. galli* and permitted fewer worms to develop. Moreover, the birds that received the antibiotics showed better weight gains than controls; and this advantage was attributed, at least in some cases, to control of the large roundworm infections. The three antibiotics were given at the rate of 15 mg. per pound of feed, and penicillin seemed to be superior to the other two. Similar findings with feeds containing 15 to 30 mg. of crystalline penicillin per pound of feed were reported by Todd and Stone[65] in 1952 although no advantage seemed to accrue from the larger dose rate.

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MARTIN P. HINES,* D.V.M., PEARL M. PAGE,** A.B., NELL HIRSCHBERG,** Ph.D., LYNN G. MADDRY,*** Ph.D., Raleigh, North Carolina

THE public health problem of ornithosis (psittacosis) epidemics among employees in turkey processing plants is well known.[1,2] At least ten outbreaks in which turkeys were suspected or proved to be the source of infection have occurred among poultry plant workers in Texas in recent years.[3]

North Carolina is a large producer of turkeys with several processing plants. In November 1954, one of the writers (M.P.H.) was contacted by Dr. Clifford Barber, poultry pathologist, North Carolina State College, who during the past two years had received several turkeys from different areas (including one group from South Carolina) which showed various stages of air-sac pathology, sinusitis, caseated masses in abdominal cavity, casts in lungs, and poor flesh. Many (2 to 8%) were being condemned on the processing line by veterinary inspectors and U. S. Army veterinarians. A history of a mild respiratory infection in approximately 10% of the flock, one to two months prior to slaughter, was obtained from the owners of several of the flocks.

With the above information, the N. C. State Board of Health, in cooperation with the local health department and plant management initiated a serological survey of the employees of two processing plants, one of which had been processing many of the suspected turkeys. Although no human epidemic was suspected, it was believed a survey would provide valuable information for physicians and plant management in the area should an outbreak occur in the future. Blood specimens were collected from employees in a plant having no relation to the poultry industry as a control group. Specific reasons for selecting a textile plant will be discussed later.

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The fact that only one low titer for syphilis was found was not surprising since blood tests for food handlers are required each year. This particular case was known to health authorities and had been treated.

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Turkey Processing Plant

This is a rather large plant under federal inspection. Turkeys are processed generally from May through December. Sanitation in this plant is rated good. During recent years veterinary inspectors, both federal and Army, have encountered groups of turkey carcasses with pathology suggestive of an unknown respiratory infection.

Seventy-six of the 119 employees bled were interviewed. Unfortunately, at the time of the interview, 43 employees were absent or no longer worked at this particular plant and 18 of those absent revealed titers to ornithosis. The interviews did not reveal any previous suggestive illnesses. Several with titers had worked in this plant only one or two years.

The duties of the 78 employees with negative serologies (includes those absent) were as follows: Pinfeather picking, 15; killing room, six; clean-up, five; office and foreman, five; packing and freezing, 27; evisceration, nine; clean giblets, four; weighing room, three. Only two employees admitted having psittacine birds in their homes, but several kept chickens at home. Six white employees' sera reacted to L.G.V. antigen, which perhaps indicates a cross reaction with ornithosis antigen. Three low titers to syphilis were observed. These were known to health authorities and had been treated previously.

Textile Plant

This plant is similar to most textile plants with numerous weaving and spinning machines. A fabric called "hair canvas" which is composed of foreign imported goat hair, cotton, wool, and rayon is processed in this plant. Early in 1953, a human case of anthrax was reported in this mill. Subsequent investigations proved the plant to be heavily contaminated with anthrax spores. After a temporary shutdown, in order to clean and disinfect the plant and machinery, operations were resumed with the requirement that all foreign imported goat hair be sterilized before shipment to North Carolina.

This mill was selected for this survey for two reasons: It was believed that it would serve as a good control, and we were anxious to determine if Q fever titers were present among the employees who had handled goat hair prior to 1953 when sterilization of goat hair was not required. The latter was confirmed in only one case. A selected group was interviewed, since we were anxious to avoid alarming employees who had already been through a lengthy anthrax investigation.

TABLE 1. Percentage of Positive Titers to Ornithosis

	No. Tested	No. Positive	Percent Positive
Textile Plant	60	8	13.3
Turkey Plant	119	39	32.7
Poultry Plant	44	17	38.6

Eight persons had titers to ornithosis. Of these, one admitted having close contact with a psittacine bird and one had previously worked in a turkey processing plant. The other six gave no histories which would account for the titers.

The finding of several Leptospira titers was surprising in view of the fact that the type of work in this plant is not considered an occupational hazard for leptospirosis. None of the employees interviewed gave histories of previous illnesses suggestive of leptospirosis or ornithosis.

Summary

1. A serological survey of 223 employees in a chicken processing plant, turkey processing plant, and textile mill, revealed that complement fixing antibodies to ornithosis (psittacosis) were present in 38.6%, 32.7%, 13.3%, of the employees respectively.

2. There was no evidence of ornithosis epidemic (past or present) among those interviewed. Presumably the virus operating in these plants is of low virulence.

3. The percentage of titers to ornithosis among employees in the chicken and turkey processing plant, compared to those in the textile plant, is significant.

4. No explanation can be given for the several titers to leptospirosis in textile plant employees.

5. The percentage of titers to ornithosis among employees in the textile plant would probably be similar in a random sample of any population.

6. Many avian species other than psittacine birds have been found to be naturally infected. Viruses indistinguishable morphologically and antigenically from the psittacosis-lymphogranuloma venereum group have been isolated from several mammalian species. This survey may reflect the contact of humans with the vast and growing reservoir of virus among birds and animals.

7. Although no recognized epidemic of ornithosis has occurred in these poultry plants,

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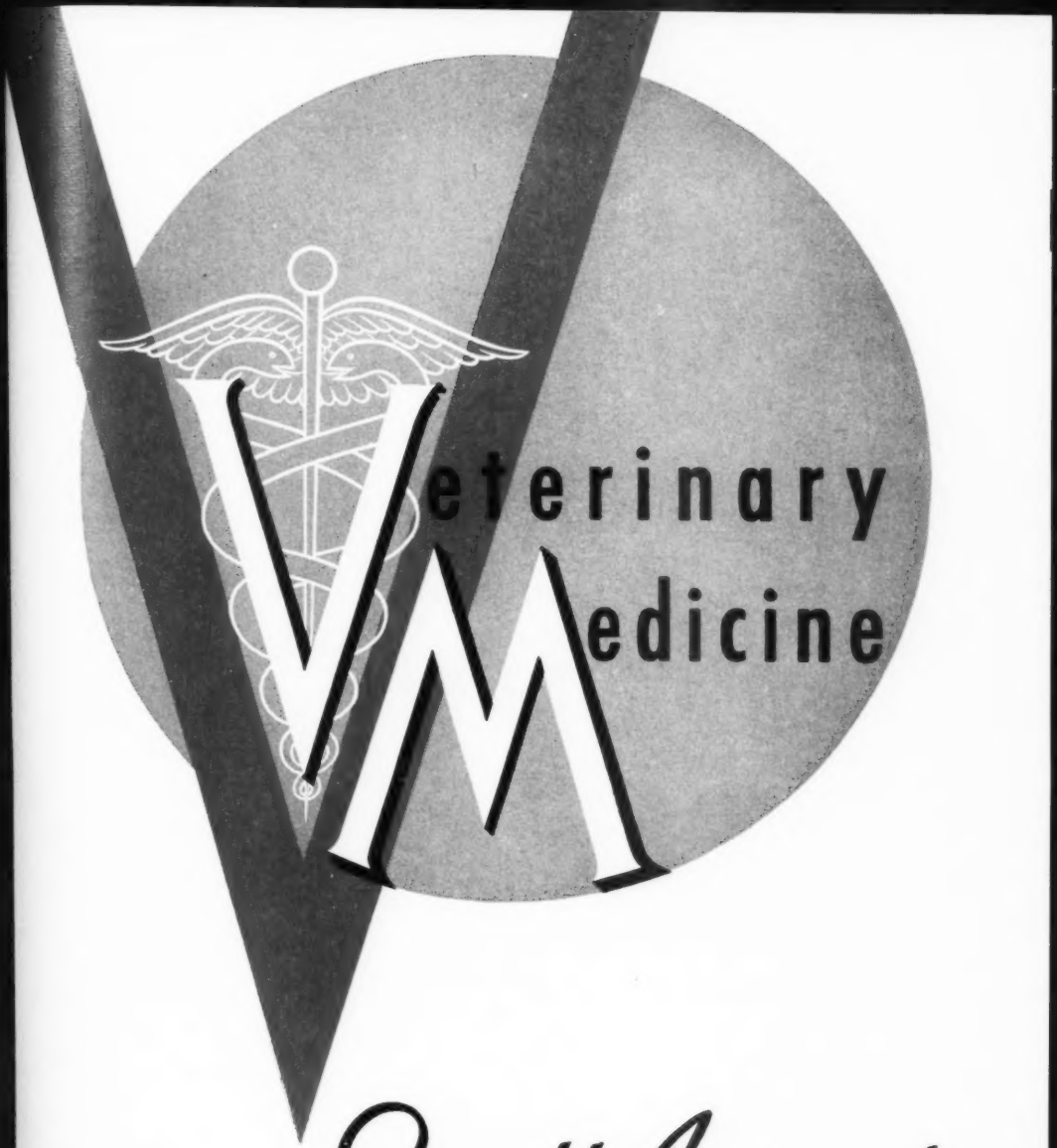

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Egg-Propagated Distemper Virus

JOHN R. GORHAM, D.V.M., Ph.D., Pullman, Washington

THE fundamental investigations of Laidlaw and Dunkin were followed by three decades in which the distemper virus turned the lance of many workers. The renaissance of distemper virus research was ushered in by adaptation of the virus to the developing chicken embryo by Haig,[1] Cabasso and Cox,[2] and others.[3,4,5,6,7] The general principle involved is that if a virus is repeatedly transferred through a new host which is initially less susceptible, its virulence for the natural host species is lessened. An illustration of the attenuation of the distemper virus is given in fig. 1.

Adaptation of Virulent Virus to the Embryonated Egg

Tissue from a distemper-infected animal is used as a source of virus. A small piece of lung or spleen is removed, ground in distilled water and treated with antibiotics to free the suspension from contaminating bacteria. Then, a few drops of virus fluid are inoculated onto the thin vascular chorioallantoic membrane that lines the shell of a half grown chicken embryo. This membrane provides a sheet of living cells in which distemper can be grown. While the procedure is not unlike culturing bacteria on an agar plate, it is a bit more involved.

After the inoculated eggs are incubated and cracked open, there is no observable evidence that the virus has multiplied. Normal appearing membranes are emulsified and an inoculation is made into a second group of partially incubated eggs. These passages are repeated several times until small discrete opaque foci (similar to a colony on a Petri plate) appear on the chorioallantois (fig. 2).

At each egg passage from then on, the virulence of the virus is reduced so that ultimately ferrets inoculated with infected membranes show no signs of disease. All viruses are capable of variation. Passage of distemper through many generations in cells of an unnatural host "sorted out" a variant distemper virus.

A Test for Distemper Antibody

The modification of the virus led to a new vaccine. For the experimenter interested in fundamental research, the dark ages were at an end. A convenient, inexpensive laboratory host was available. In almost all distemper investigations, one requires procedures for the titration of antibody. One method, depicted in fig. 3 consists of a test to measure the least quantity of antibody that will neutralize a standard quantity of virus.

Presented at the 24th annual meeting of the American Animal Hospital Association, San Francisco, Calif., May 8-11, 1957.

From Animal Disease and Parasite Division, U. S. Department of Agriculture in cooperation with Agricultural Experiment Stations, Washington State College.

This investigation was supported in part by funds provided for Biological and Medical Research by the State of Washington, Initiative Measure no. 171, and a grant from the Fine Chemicals Division, American Cyanamid Company, Pearl River, New York.

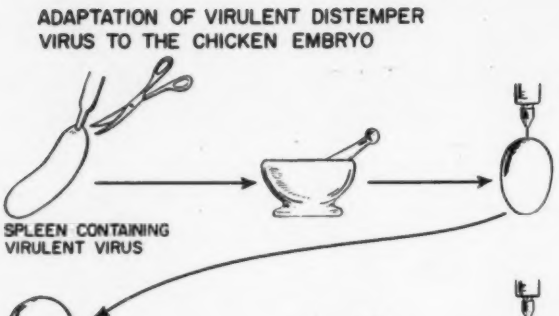

ADAPTATION OF VIRULENT DISTEMPER VIRUS TO THE CHICKEN EMBRYO
SPLEEN CONTAINING VIRULENT VIRUS
HARVEST OF THE CHORIOALLANTOIS
EGG PASSAGES REPEATED

Figure 1.

If one inoculates adapted virus onto the chorioallantoic membrane, pocks or plaques representative of virus appear after a suitable incubation period. Similarly, when virus and normal dog serum are mixed and injected in the same manner, lesions again develop on the membrane. If, however, virus is added to immune serum, the virus is neutralized by distemper antibody. Since the infectivity of the virus is removed by antibody, no pocks are found in the injected egg membranes. To measure the potency (titer) of a serum sample, one dilutes the serum in regular increments, 1:10, 50, 250, and so on; each dilution is mixed with virus and inoculated into six or eight eggs. Thus, the smallest quantity of antibody (most dilute serum) that will neutralize the virus and prevent infection of the embryonated egg is our endpoint.

This neutralization test is basic serologic technic in the study of viruses and probably provides the most specific and significant knowledge of the immune reaction. We, as well as others, have used the neutralization test in a variety of trials.[5,9,10,11,12,13] It may be of interest to cite some examples.

A couple of years ago, the neutralizing power of commercial antisera was tested in our laboratory. Seven commercial producers in the United States provided us with serum specimens, and one bottle of hard pad antiserum was purchased from a British concern. In all, 21 lots of serum were tested against four egg-adapted strains of virus. The results of the tests revealed that there was hardly any difference between lots, irrespective of whether the serum donor dogs were hyperimmunized with virulent virus or distemper-infected egg membranes (fig. 4). As expected, in this experiment the distemper antibody titer was not affected by the presence of hepatitis antibody.

If you will permit me to digress, I should like to say that we consider hard pad to be the illegitimate son of distemper. In the fall of 1949, Dr. D. R. Cordy and I inoculated a series of ferrets with nervous tissue from 14 cases of demyelinating encephalitis in dogs. In ten of the 14 pairs of ferrets inoculated, the typical incubation period for distemper was observed. All infected ferrets succumbed to the disease.[14] The picture was clarified by several independent investigators.[15,16,17,18,19,20] Their evidence indicates that hyperkeratosis of the foot pads with nervous signs are manifestations of Carré's virus.

The importance of immunization by natural infection was observed in dogs of the Pullman, Wash. area.[21] It was found that most of the city dogs over six months of age with no history of vaccination had higher antibody titers than their country cousins. It is evident that repeated infections contribute to the heightened resistance of the city dogs and plays a role in shaping the natural history of the malady. Further studies on the development, distribution, and persistence of distemper antibody may eventually elucidate how both the dog and virus persist from generation to generation in nearly a balanced situation.

In applied research, as in vaccination trials,[22]

the neutralization test is a valuable adjunct to challenge with virulent virus. In fig. 5, there is the serologic history of two dogs of particular interest. When dogs 1-A and 2-A were six weeks of age, they were injected with egg-adapted virus. As expected, vaccination induced an antibody rise. A decline in titer was observed at 2½ months, and at three months the dogs were divided — 1-A was isolated and 2-A was naturally exposed to clinical distemper for 18 days. Subsequent titration data revealed that the antibody level of dog 2-A was maintained at fairly constant level, whereas dog 1-A, receiving no subclinical immunization, had a marked decline. In order to assess further the significance of the titers, it was decided to subject both dogs to a severe challenge. Approximately 6½ months following vaccination they received an intracerebral inoculation with virulent virus. Neither dog showed signs of distemper infection, and both exhibited a rapid antibody rise. It is of interest to note that there was an apparent ceiling in the antibody response following intracerebral injection, irrespective of whether the dog had a high or low blood serum titer at the time of challenge.

Egg-Propagated Virus as a Vaccine

The aim of the veterinary practitioner is either to eliminate the possibility of distemper exposure, or if this is not feasible, to provide harmless immunization, which will lessen the severity and incidence of the malady. It is fairly obvious that neither attenuated nor killed virus vaccines will produce a greater level or higher quality antibody than that caused by natural infection.

Vaccination with properly prepared killed-virus preparations eliminates the danger of infecting the vaccinee. Furthermore, this dog can not be a source of virus for other dogs as a result of the vaccination. However, killed-virus distemper vaccines are poor antigens and elicit a minor grade of immunity. One should not expect to produce a permanent immunity in a dog with one or more injections of a killed-virus vaccine. Field exposure is a necessary part of such a program. A probable sequence of events following vaccination may be expressed as follows. If the dog has not had time to develop resistance before it is exposed, clinical distemper may ensue; or, if the antibody level is high, the dog will be subclinically immunized; or, if the antibody has declined, the dog will again be susceptible. In a recent trial, we found only four of ten ferrets refractory to challenge six months after receiving one injection of a killed-tissue vaccine.

Live virus, of which the egg-adapted variant is an example, possesses some disadvantages. First, the virus must be living at the time of administration. Dead virus, *viz.*, virus dying from prolonged storage or other environmental influence, has no antigenic activity. To protect the life of the virus, efficient freeze drying and the use of suspending medium having a marked sparing action on the virus are necessary. Routine culture for contaminating microorganisms and potency titrations on the final product, of course, are part of all manufacturer's procedure.

Since the egg-propagated virus is living, it is theoretically possible that the attenuated virus could revert to virulence. To provide us sufficient numbers which allow more biologic situations, we can better draw on our experience with mink where it is not unusual to vaccinate 10,000 to 15,000 animals on a single ranch. As far as the vaccinated animal is concerned we have no supporting evidence that

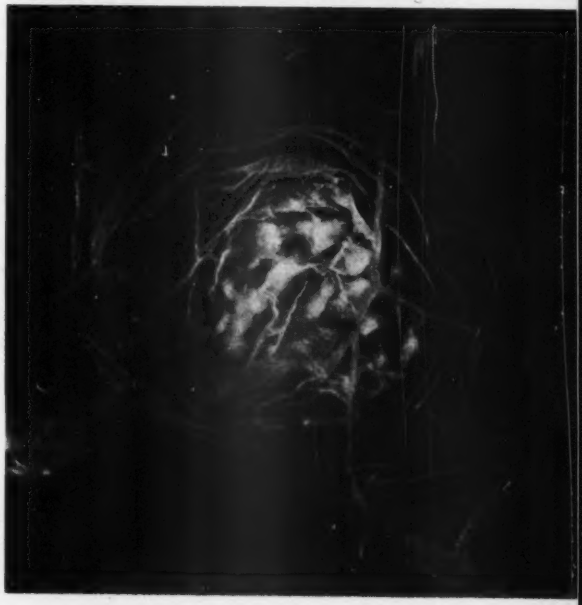


Fig. 2. Photograph of an infected chorioallontoic membrane showing typical discrete foci (seven days incubation).

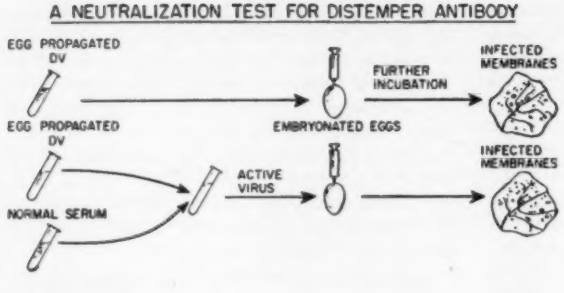


Figure 3.

reversion has ever taken place.[23] However, natural host-to-host passage of any attenuated virus with the possibility of a virulent virus arising is something we need to know more about.

Much concern was occasioned by the apparent attraction of the unborn for attenuated hog cholera and blue tongue virus.[24,25] Although subjective interpretation of virus behavior is risky, one wonders if vaccination of the bitch in early gestation with the egg-adapted variant would initiate pathological changes.

Living egg-adapted virus is a tremendous stimulus for antibody mechanism because it actually induces an infection in the host. A relatively small number of virus particles are introduced; however, the variant virus multiplies in the vaccinated host almost as well as virulent virus. On the other hand, the quantity of antigen available to the host in an inactivated vaccine is only that contained in the syringe.

Recent work in our laboratory has provided evidence that egg-passaged virus multiplies in the vaccinated host. A group of ferrets were inoculated with egg-adapted virus. At regular intervals thereafter ferrets of this group were killed; spleens were removed and inoculated into what we designated as indicator ferrets. The indicator ferrets were later injected with virulent virus. If the egg variant multiplied in the ferrets injected with regular egg-adapted virus, it is reasonable to assume that tissues harvested from these ferrets contained virus,

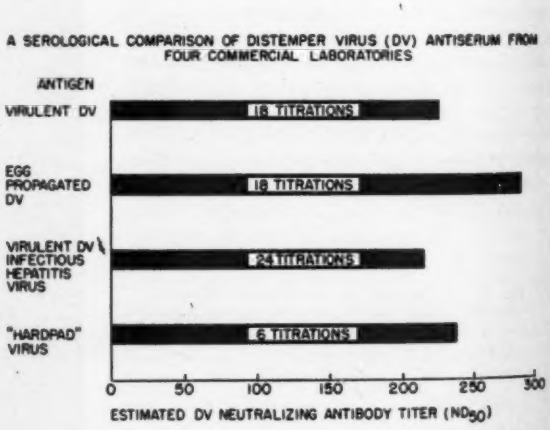


Figure 4.

which in turn, would immunize the indicator ferrets. These indicator ferrets were challenged to ascertain whether they were immunized.

I have taken more than the usual liberty in interpreting the results of the test (fig. 6). After a preliminary lag phase, the egg variant reached its maximum titer in about six to nine days. Thereafter, the level of variant virus fell until it was no longer detectable about the 18th day after vaccination. We have no direct evidence as to why the titer of variant virus declined. It is probable, however, that antibody formed in response to the stimuli may have neutralized the egg-adapted variant just as it would its virulent counterpart.

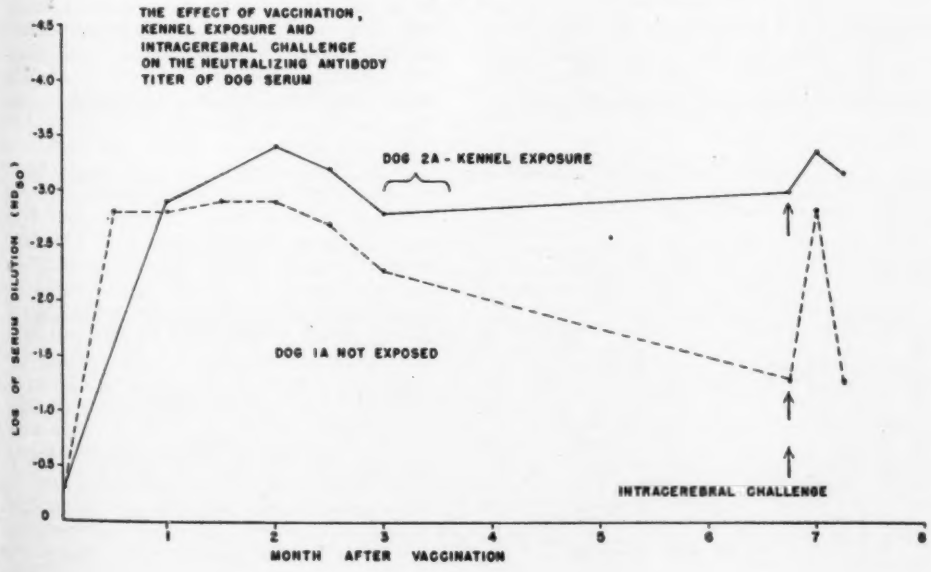
Since the variant virus multiplies relatively soon after injection, it has the desirable effect of interfering with later exposure to virulent virus. Several workers have shown that ferrets were refractory to exposure within 48 hours after vaccination.[26,27,28] Because of the different genetic backgrounds in dogs, one could not expect such an uniform response. Indeed, Schindler found the susceptible interval in dogs to be short but more variable.[29]

In all probability, ferrets receiving a single injection of egg virus will be immune for life. Cabasso[30] has demonstrated that the immunity lasts for 5½ years, and we have shown ferrets to be immune for at least two years. The case/fatality rate for distemper in ferrets approaches 100%. This fact, coupled with the finding that ferrets are infected with a more dilute vaccine, suggests that the ferret responds to the egg virus to a greater degree and obtains a more permanent immunity. I should like to hazard the guess that there may be an inherited factor in dogs which determines the duration of immunity. The question can not be resolved by field observations, because the dogs must be completely isolated from the time they are vaccinated until challenged. We have found foxes to be immune two years after vaccination, but, this is another species and only indicates what to expect in dogs. About a year ago, a group of Beagles were vaccinated to determine the duration of their immunity.

My coworker, Dr. Richard Ott discussed the most important practical aspect of egg-propagated virus usage at the American Animal Hospital Association meeting in Miami in 1956.[31] That is: When should one vaccinate? In that paper, he emphasized that modified virus should be administered when the passively transmitted antibody from the dam is at a low level, inasmuch as distemper antibody can neutralize or destroy living egg-adapted virus as easily as its virulent relative.

While the practitioner may occasionally encounter litters of pups from distemper susceptible dams, the majority of young dogs presented for vaccination are out of immune bitches. Since there is no convenient method of determining the immune status of the dam,

Figure 5.



we consider all pups to be carrying maternally conferred antibody.

Although definitive evidence is not yet available, I have drawn a graph (fig. 7) to give our own interpretation of what occurs in passively protected pups exposed to infection with either virulent or egg-propagated virus. In this discussion, I am disregarding the differences in disease producing power and/or invasiveness between modified and virulent virus. Doctor Gillespie of Cornell University suggested that about 75% of pups at about five weeks of age are refractory to challenge with virulent virus and presumably to vaccination as well.[18] We have arbitrarily designated 20% of pups immune to distemper when they reach seven weeks of age, and at nine weeks we believe only a few (<1%) are capable of inactivating the virus.

It is fairly obvious to you as practitioners, that you are in a rather precarious position. If you vaccinate too early, the vaccine is neutralized by antibody, whereas, waiting will only increase the chance of exposure. At Washington State College, we have attempted to adapt ourselves to the situation by vaccinating at seven and nine weeks, or by vaccination when the dog first enters the clinic followed by a second vaccination two weeks later. At seven weeks, one should expect protection following vaccination in approximately 80% of the pups. A second injection is given at nine weeks to evoke an immune response in the remaining 20%. Those few dogs that fail to respond at nine weeks may be from bitches with an extremely high antibody level. Moreover, there is some evidence that animals occasionally fail to give an immune response. Whether the latter observation represents immunologic paralysis or the tolerance phenomenon[20] is conjecture that may eventually be considered.

The preferred procedure is what we have termed the W.S.C. flood technic. It is based on the simple economic premise that the cost of the vaccine is not a factor since it is a by-product in our experiments. Every time the clinicians see a dog, it is injected — old dogs, young dogs, boarders — anything that barks. If the owner requests vaccination he pays for it; otherwise, his dog may receive four or five vaccinations at no cost. According to my colleagues in the clinic, this multiple injection procedure has reduced the prevalence of distemper in our area. It is not unusual for a dog to be vaccinated at 6, 8, 10 and 12 weeks of age, and later in its life depending upon when it is returned to the clinic for other procedures.

The danger of antiserum given prior to egg vaccine with the resultant neutralization of the virus was also discussed at the Miami meeting.[21] Dr. Charles York has likewise explored this possibility.[23]

We recently completed an experiment using ferrets which leads to rather disturbing findings in the light of previous research. Homogolous antiserum given simultaneously at different sites with egg-adapted virus can occasionally interfere with the egg vaccine. Thus, at least under the conditions of this preliminary trial, antibody apparently reached the egg virus particle and rendered it noninfective before it could enter susceptible cells.

Vaccination failure is a subject that appeals to no one. It makes the hair stand up on the back of the neck of the research man, the commercial producer, the practitioner, the client, and I suppose, the poor dog if it survives. Surely, poor vaccine, passive immunity, either

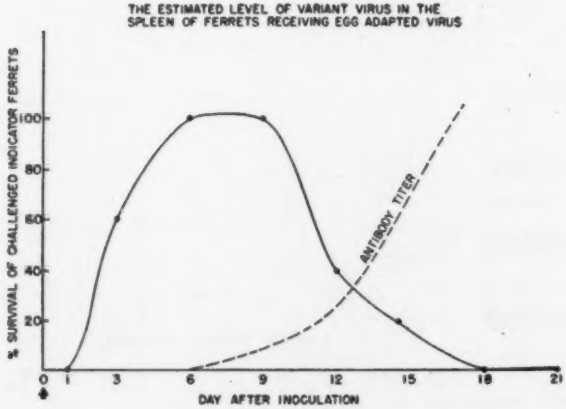


Figure 6.

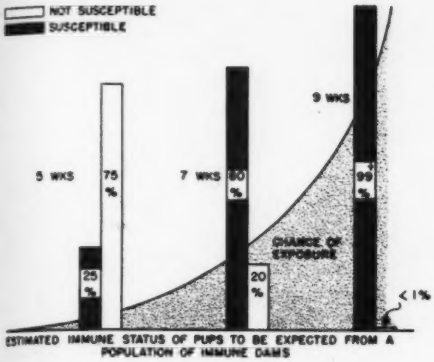


Figure 7.

maternal or in the form of antiserum, and prior exposure contribute to the failure to immunize. But, to get us all off the hook — except the dog — are meticulous history taking, thorough physical examination, and an alert mind sufficient to diagnose distemper? I believe the odds are with me when I say there is a hodgepodge of unknown acute infections, most likely due to viruses, which produce respiratory, nervous, and gastrointestinal signs. The practitioner must await findings of experimental virologists, who in turn, must await funds which are presently rather limited for canine research.

The Use of Egg Virus in the Treatment of Distemper

Our results can be summed up quickly by stating that egg-adapted virus has not been successful in the treatment of distemper either clinically or experimentally. According to our clinicians, subcutaneous or intracerebral inoculations in dogs have been to no avail in altering the course of the disease. Using mink, which resemble dogs more than ferrets in their response to the virus, Doctor Farrell conducted an experiment in which he attempted to prevent the occurrence of encephalitis by intracerebral administration of egg-adapted virus during the incubation period.[34] He first injected 69 mink with distemper, nine days later an intracerebral inoculation of egg virus was given to 37 of them. From then on he picked up dead mink. All but one inoculated control succumbed and every "treated" mink died. About 80% of the mink in both groups exhibited clinical encephalitis.

There is good reason for the failure of these experiments. By the time the practitioner has an opportunity to treat a dog with distemper, the virulent virus has an overwhelming advantage. Nine days after infection, one could expect that a lung suspension of roughly 1 in 1,000,000 would kill a ferret. It is reasonable to assume that the virulent virus has invaded most of the susceptible cells and is busily converting cell substance into more virulent virus.

That the wily distemper virus is going to struggle for its existence is evident. There is no one here that will disagree with me if I say the virus has been remarkably successful in maintaining a constant equilibrium with its host. The only rightful approach to the study of the disease is to elucidate the means by which the virus persists from one host generation to another. When a coherent account has been obtained, it should be much easier to fit vaccination into a niche that will fulfill the purpose for which it was designed. Surely, artificial immunization will not always be the hit- and-miss affair that it is today.

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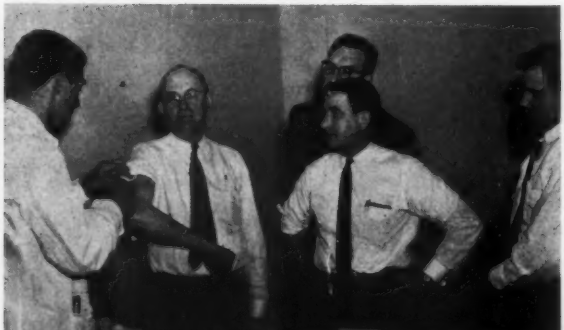
Rocky Mountain spotted fever, largely so named because of the outstanding skin symptoms in infected human beings due to a Rickettsia transmitted by the bite of the American dog tick (*Dermacentor variabilis*) and the wood tick (*Dermacentor andersoni*), is the subject of a discussion by Cawley and Wheeler (*Jour. Am. Med. Assn.*, Mar. 23, 1957). It is of interest to note that of a total of 74 cases observed by these authors there was no history of a tick bite "but most of these patients had removed ticks from dogs with their fingers." Especially in those regions where Rocky Mountain spotted fever is relatively common (Colorado, Montana, and Wyoming, also Maryland, Virginia, and North Carolina) it is well to warn dog owners to exercise care in the removal of ticks from their pets by means of their fingers. Most frequently ticks on human beings acquired during picnics and otherwise should be considered with suspicion and removed as soon as possible. Annual vaccination of children is said to be of value. Early use of antibiotics is an established treatment.

▼ ▼ ▼

The average adult American eats about 1,500 lb. of food each year. This is equal to eating his own weight in food every six to eight weeks. — *Agri. Newsletter, Jan.-Feb., 1957.*

HEP Rabies Vaccine Demonstrated at Georgia Meeting



Leaders of the Georgia Veterinary Medical Association joined with the Public Health Service's Communicable Disease Center, Atlanta, Ga., recently in a program designed to show the value of high egg passage (HEP) rabies vaccine in protecting high risk groups against the disease. Dr. Clay C. Von Gremp, president of the Georgia Veterinary Medical Association, is shown here receiving an injection of the vaccine from Dr. Thomas A. Engle, officer in charge of the CDC Medical-Dental Clinic. Drs. James L. Johenning and D. C. Ford, practicing veterinarians in the Atlanta area, and Dr. James H. Steele (rear), chief veterinarian of CDC, are the observers.

Ringworm In Cats Caused By *Microsporum Gypseum*

WILLIAM KAPLAN,* D.V.M., LUCILLE K. GEORG,* Ph.D.,
CLARE L. BROMLEY, JR.,** D.V.M.

THE relatively common occurrence of the dermatophyte, *Microsporum gypseum (M. fulvum, Achorion gypseum),* in soil has been demonstrated by several investigators.[1,2,3,4,5] In one study carried out by Ajello,[2] this fungus was recovered from 37 (31.9%) of 116 soil samples collected in Tennessee and Georgia. These findings point to the many opportunities for animals and man to come in contact with this agent in nature. In spite of this fact, authenticated cases of feline ringworm caused by *M. gypseum* are apparently rare. In an extensive review of the world literature Ajello[2] found that up to 1953 only four such infections had been reported. Since that review, two additional reports of feline infections by this fungus have appeared in the literature,[6,7] making a total of six authenticated cases. Two of these have been described from the United States, and the remainder from other countries.

The present report describes the clinical and mycologic findings on four additional cats found to be spontaneously infected with *M. gypseum.* In all four cases, the animals involved manifested obvious skin lesions, and the attending veterinarians submitted hair and skin scrapings to the Mycology Laboratory of the Communicable Disease Center, Chamblee, Ga., for laboratory examination.* The four cases were diagnosed during the year 1956.

Clinical Data

Clinical findings and other data are summarized on table 1. As noted on this table, the four cats were domestic short hairs. Two of the animals were kittens, and two were adults. The cats had been raised in suburban areas located in three different states.

As summarized on table 1, the cats manifested varying degrees of tissue involvement and tissue response to invasion by the dermatophyte. These reactions varied from a mild scaling condition accompanied by some degree of alopecia to a marked inflammatory response, accompanied by suppuration. There was no apparent correlation between the severity of the lesions and the age of the cats. In two cases the lesions were located on the head and in two cases on the extremities. Figure 1 illustrates the appearance of lesions manifested by cat number one.

Fig. 1. Skin lesions between toes of cat caused by *Microsporum gypseum,* showing scaling, erythema, and loss of hair.

There was no evidence of transmission of infection by cats involved to human contacts.

Mycologic Findings

At the laboratory the clinical materials submitted from each cat were examined under the Wood's light. In no case was fluorescence of hairs observed.

The direct microscopic examination of the specimens showed tissue invasion by a dermatophyte in all four cases. This was accomplished by placing a few hairs and skin scales in a drop of 10% potassium hydroxide on a glass slide, adding a cover slip, and gently heating the preparation over a Bunsen burner for a few seconds to hasten clearing. Examination was then carried out under both low and high

*From the Communicable Disease Center, Public Health Service, U. S. Department of Health, Education and Welfare, Atlanta, Ga.
**Veterinary practitioner, Atlanta, Georgia.

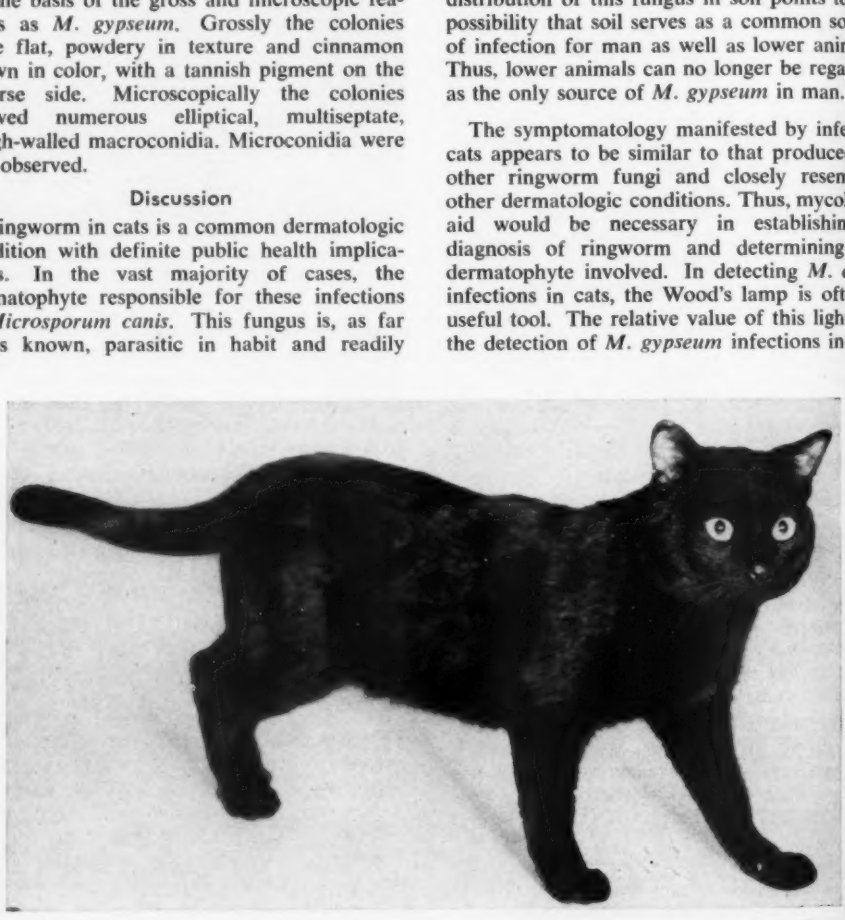
power. In the case of cats number 1 and 2, mycelium was found in the skin scales and within the hairs. In addition chains of large arthrospores (5-7 microns) in diameter were observed on the surface of the hairs. In the case of cats number 3 and 4 mycelium was readily observed within the skin scrapings; however, invaded hairs were not detected. The typical Microsporum pattern of hair invasion, as commonly seen in *M. canis* infections, *i.e.* small spores (2-3 microns) in a mosaic sheath, were not seen in these cases.

To isolate and identify the species of fungus involved in each case, the specimens were cultured on a special, selective isolation medium containing the antibiotics cycloheximide, penicillin, and streptomycin.[9] After five days of incubation at room temperature (25 C.), the dermatophyte responsible for the infections was recovered in pure culture and identified on the basis of the gross and microscopic features as *M. gypseum*. Grossly the colonies were flat, powdery in texture and cinnamon brown in color, with a tannish pigment on the reverse side. Microscopically the colonies showed numerous elliptical, multiseptate, rough-walled macroconidia. Microconidia were not observed.

Discussion

Ringworm in cats is a common dermatologic condition with definite public health implications. In the vast majority of cases, the dermatophyte responsible for these infections is *Microsporum canis*. This fungus is, as far as is known, parasitic in habit and readily transmitted by animal to animal or animal to man. On the other hand, *M. gypseum* is essentially a soil saprophyte which apparently does not require live animal tissues for propagation. However, under certain conditions *M. gypseum* is capable of assuming a parasitic existence and producing alterations of invaded host animal tissues. Infections of the dog and the horse by *M. gypseum* are apparently quite common, as evidenced by our recovery of this organism from 57 of 253 cases of canine ringworm and 10 of 12 cases of equine ringworm during the year 1956.[10] Infections in man by *M. gypseum* are relatively uncommon. In several surveys of human ringworm this fungus has been found to be the cause of only 0.7-2.1% of the infections studied.[11,12,13] The source of the human *M. gypseum* cases have been attributed in the past largely to contact with infected animals. However, the widespread distribution of this fungus in soil points to the possibility that soil serves as a common source of infection for man as well as lower animals. Thus, lower animals can no longer be regarded as the only source of *M. gypseum* in man.

The symptomatology manifested by infected cats appears to be similar to that produced by other ringworm fungi and closely resembles other dermatologic conditions. Thus, mycologic aid would be necessary in establishing a diagnosis of ringworm and determining the dermatophyte involved. In detecting *M. canis* infections in cats, the Wood's lamp is often a useful tool. The relative value of this light for the detection of *M. gypseum* infections in cats



has not been fully appraised. Our findings in the four cases reported in this paper and our experience with other infected host animal species would indicate that this tool is not appropriate for the detection of *M. gypseum*-induced ringworm. Only by the direct microscopic examination of clinical material followed by culture can infections caused by this soil saprophyte be diagnosed.

The paucity of reports in the literature of *M. gypseum* ringworm in cats would indicate that this infection is rare. However, the common occurrence of the agent in nature and the many opportunities for these animals to come in contact with this organism suggest the possibilty that continued culture studies of feline dermatophytoses may show this organism to be a not uncommon cause of disease.

Siamese Cats

Summary

The clinical and mycologic findings in four cats spontaneously infected with *Microsporum gypseum* are described. The animals involved exhibited obvious skin lesions at the time diagnoses were made. Prior to this report only six authenticated infections in the cat by this dermatophyte have appeared in the world literature.

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TABLE 1. Clinical Findings and Other Data on Cats Infected with *Microsporum Gypseum*

Ident. no.	Breed	Age	Sex	Residence	Type of Lesion	Location of Lestion
1	Domestic short hair	2 yr.	F	Ga.	Dry, scaling, eczematoid	Between toes of right hind leg
2	Domestic short hair	3 yr.	M	Ga.	Diffuse erythema, alopecia, with suppuration	Head
3	Domestic short hair	4 wk.	M	Ks.	Scaling, slight loss of hair	Leg
4	Domestic short hair	6 wk.	M	Ill.	Kerion*	Head

*Raised, boggy lesion, suppurating at many points.

Intramuscular Chloramphenicol† In Small Animal Practice

ROBERT F. BORGMAN,* D.V.M., M.S., Asheville, North Carolina

CHEMOTHERAPY has been an ever changing field, with newer compounds replacing older ones as pathogens became resistant. Only a few years ago the sulfonamides were somewhat replaced by antibiotics because some strains of pathogens had become sulfonamide-resistant. More recently, medical practitioners have been using the "broad spectrum" antibiotics to an increasing extent since some infections have become refractory to penicillin therapy.[1] Broad spectrum antibiotics may be defined as those being effective over a wide range of both Gram positive and Gram negative bacterial infections. One of these, chloramphenicol, (chloromycetin)® was found to be the antibiotic of choice in the treatment of many infections to which small animals are subject, as indicated by *in vitro* sensitivity tests of 200 cultures conducted by a veterinary diagnostic laboratory during 1955.[2] Similar results have been obtained with *in vitro* sensitivity tests in this small animal practice.

While chloramphenicol *per os* maintains effective therapeutic blood levels because it is easily absorbed from the intestinal tract, the oral route is not feasible in some cases. Intramuscularly, blood levels in experimental dogs were satisfactory, with about the same dosage, as the oral route.[3,4,5,6] On the basis of these trials it was the purpose to determine the value of intramuscular chloramphenicol in small animal practice.

Treatments and Results

Intramuscular chloramphenicol was injected at the rate of 20 to 30 mg. per lb. body weight per day in divided doses every 12 hours; the injection site rotated between the fleshy portions of the thighs and forelimbs in large dogs, and the thighs alone in small dogs and cats. In the few cases developing tenderness at the injection sites or in those on extended therapy, the compound was given orally in capsules at the same dosage rate after injections were stopped. Therapy was continued one to two days after apparent recovery. In the described cases, dihydrostreptomycin was given in addition at the rate of ¼ to 1 gm. in a single daily injection, unless otherwise noted. The results are outlined (table 1) and included all cases treated for the diseases mentioned.

Dogs

In the distemper complex, treatment also included the use of distemper-hepatitis antiserum in early cases and, when necessary, appropriate supportive therapy such as ophthalmic ointments, dextrose solution intravenously, and vitamins. Treatment was initiated with chloramphenicol and dihydrostreptomycin in all but three cases which had relapsed after improving with treatment by other antibiotics. These three cases recovered under this therapy. Of the 15 cases listed in the "fair" column, six were recovering from the bacterial phase of the distemper complex but developed fatal encephalitis; the remaining nine improved under the therapy but later relapsed and were treated successfully with other antibiotics. Of the six cases in the "poor" column, five developed fatal encephalitis shortly after the initiation of therapy, and the other was almost moribund at presentation and died two days later.

Other respiratory infections, apparently uncomplicated by the virus of Carré, responded well. In pneumonia, supportive treatment consisted of ophthalmic ointments and vitamins with most cases evidencing rapid recovery. The three cases in the "fair" column improved with the therapy but later relapsed and were treated successfully with other antibiotics. The case in the "poor" column was weak when presented and died three days later.

Bronchitis

The acute phase of bronchitis subsided rapidly, with half of the cases evidencing a

†Intramuscular chloramphenicol, also termed intramuscular chloromycetin, is a product of Parke, Davis & Co., Detroit, Mich.

*Formerly director Skyland Animal Hospital. Present address: Department of Physiology, School of Veterinary Medicine, Kansas State College.

®Parke, Davis & Co., Detroit, Mich.

The "other antibiotics" used were tetracycline and erythromycin.

cough for several days and requiring expectorants or anodynes. The cases suffering pharyngitis were treated with chloramphenicol alone and recovered rapidly.

Salivary gland infections affected the sublingual glands in one case and the parotid glands in three. Stainless iodized ointment with methylsalicylate was applied locally in addition to the other therapy. All recovered, only one case requiring incision.

All five of the urinary tract infections had kidney involvement, with complicating cystitis present in two cases. In these later two, multitudes of hemolytic streptococci were present in the urine which proved more sensitive to chloramphenicol *in vitro* than to the other commonly used antibiotics. One of these cases was listed in the "fair" column because the dog relapsed three months later. Euthanasia was requested in this instance. Of the three cases in which infection was apparently centered in the kidneys alone, one followed trauma. Methenamine was given in addition to the other therapy.

Most of the phlegmon resulted from wounds and all responded to the therapy, with supplemental treatment with local antiseptics. Wounds also caused the five cases of osteomyelitis and were treated in the same manner as the phlegmon. *Staphylococcus aureus* was isolated from both cases in the "fair" column, and both cultures were more sensitive *in vitro* to chloramphenicol than to other commonly used antibiotics. One of these required removal of the infected metacarpal and the other relapsed and was successfully treated with another antibiotic to which the culture was also sensitive. The remaining cases responded without complications, and it was of interest to note cases of short durations were those without complications.

Cats

Infectious enteritis is also termed feline distemper and feline panleukopenia. When indicated, homologous antiserum, intraperitoneal blood injections, or both were given in addition to the therapy. Most cases recovered fairly rapidly, but the case listed in the "fair" column relapsed and was treated successfully with another antibiotic.

Pneumonitis is also termed feline distemper by some, and is an infection of the upper respiratory tract characterized by coryza and pharyngitis, but may later terminate in pneumonia. A commercial antibacterial serum was used with the therapy and recovery followed in most cases. The cases in the "poor" column were switched to other antibiotics, and recovery resulted in one case, death in the other.

The therapy for phlegmon was augmented with local applications. Recovery was effected in all but one refractory case that was treated successfully with other antibiotics. These infections all resulted from fight wounds.

TABLE 1. Response of Dogs and Cats with Intramuscular Chloramphenicol in the Treatment of Certain Infectious Diseases

Disease	No. cases	No. cases febrile	No. cases showing no temp. drop under therap.	Days required for temp. drop		Days required for temp. to become normal		Opinion of effectiveness		
				Range	Avg.	Range	Avg.	Good	Fair	Poor
(DOGS)										
Distemper complex	44	36	5	1-3	1.1	1-4	1.4	23	15	6
Pneumonia	10	6	0	1-2	1.3	1-2	1.3	6	3	1
Bronchitis	4	2	0	1	1.0	1	1.0	4	0	0
Pharyngitis	3	2	0	1	1.0	1	1.0	3	0	0
Salivary gland infection	4	2	0	1	1.0	1	1.0	4	0	0
Nephritis	5	2	0	1	1.0	1	1.0	4	1	0
Phlegmon	9	7	0	1	1.0	1-2	1.1	9	0	0
Osteomyelitis	5	3	0	1	1.0	2-4	3.0	3	2	0
Total dogs	84									
(CATS)										
Infectious enteritis	5	3	0	1	1.0	1-2	1.7	4	1	0
Pneumonitis	11	7	1	1-3	1.3	1-3	1.3	9	0	2
Phlegmon	4	3	1	1	1.0	1-3	2.3	3	0	1
Total cats	20									

Discussion

While the dosage of chloramphenicol necessary is about the same by either the oral or intramuscular route, the latter insures a blood level when the animal is difficult to dose orally or is vomiting, and therefore has a special advantage in cats.

In many infections, the etiological agent is difficult to isolate and test for sensitivity. Clinical improvement and/or reduction of fever occurred within 24 hours in those cases responding to intramuscular chloramphenicol. When the pathogen was found to be sensitive *in vitro*, results of treatment bore out these findings.

The microcrystalline form of intramuscular chloramphenicol apparently allows the antibiotic to be slowly absorbed from the injection site, since blood levels have been maintained 12 hours in cattle[7] and injections every 12 hours effected recovery from shipping fever in calves.[8]

The pH of the intramuscular preparation is about neutral so there was no unusual discomfort at the site of injection. None of the cats developed soreness at the injection sites, and only three dogs evidenced a transient tenderness starting several hours after the injection and lasting for only one to two days. There was no sign of tissue damage and tenderness occurred in only about 0.5% of the injections in dogs which is not an appreciable hazard for use of the agent. Routine blood examinations which included sedimentation time, icterus index, RBC, hematocrits, and WBC on dogs indicated no untoward effects upon the hematopoietic system by chloramphenicol. Large oral doses of chloramphenicol to dogs for extended periods have not affected the hematopoietic system.[9]

Dihydrostreptomycin with chloramphenicol gave good results, as might be expected since a synergism has been demonstrated *in vitro* between the two[10,11] and the combination doubtless reaches a wide range of pathogens. This combination has been used effectively in clearing the gastrointestinal tract in man prior to colonic surgery, and in treating complications of that surgery.[12,13] This combination also has been successful in the treatment of gastrointestinal infections in dogs.[14]

Treatment of the distemper complex in dogs presents a difficult problem. While the primary etiological factor is the virus of Carré, other pathogens complicate most cases, such as several species of bacteria, infectious hepatitis virus, and protozoan parasites.[15] If animals which developed fatal encephalitis were omitted (table 1), 97% were aided by the therapy, and 70% made complete recoveries. These results were similar to those of others using oral chloramphenicol.[16,17,18,19] No claims were found in the literature for a chemotherapeutic agent in the treatment of the encephalitis following the distemper complex. This sequel is generally considered to result in some manner from the virus infection.[15]

Therapy was effective in other respiratory infections not complicated by distemper, such as pneumonia, bronchitis, and pharyngitis, as found by others.[16,19,20] Infections of the salivary glands responded well as expected, since effective drug levels have been found in the saliva of man following intravenous injection of chloramphenicol.[21] Results in the treatment of urinary infections were good, and chloramphenicol has been termed an antibiotic of choice in the treatment of human urinary infections.[22] Wound infections and infections of the bone marrow of short duration responded rapidly, but chronic bone infections tended to relapse. Other infections in dogs such as coryza, stomatitis, arthritis, orchitis, and keratitis with ulceration were treated in limited numbers with good results.

Intramuscular chloramphenicol proved especially valuable in the treatment of infectious enteritis in cats because of the emesis associated with the disease. Oral dosage has given good results for others.[16] Pneumonitis responded satisfactorily with some relapses. This antibiotic has been found superior in the treatment of pneumonitis[23] by another investigator. A limited number of cases of phlegmon, osteomyelitis, and stomatitis in cats responded well.

Summary

A variety of infectious diseases in dogs and cats responded satisfactorily to intramuscular chloramphenicol, accompanied in most cases by dihydrostreptomycin injections, and in some cases by supportive treatment. The intramuscular route had the advantages of assuring a blood level in animals in cases when oral administration was unfeasible. It also required less frequent administration due to the repository nature of the intramuscular form. Tenderness at the site of injection was uncommon and not a hazard. Intramuscular chloramphenicol therapy was particularly valuable and can be recommended in cases when the antibiotic sensitivity of the etiological agent can not be determined. The prompt improvement seen in

cases that responded supplements the validity of this statement.

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Presentation of Awards San Francisco Meeting of the American Animal Hospital Association

The Mark L. Morris Animal Memorial Foundation Award for outstanding professional service in the field of small animal medicine was presented Dr. J. V. Lacroix, well known small animal practitioner and former editor of the North American Veterinarian. Dr. Mark L. Morris (l.) is shown here presenting the handsome plaque to Doctor Lacroix.

Dr. Jack O. Knowles, Miami, Fla., (left) receives his "Fido" award as Veterinarian of the Year from Harry Miller, director of the Gaines Dog Research Center, the award sponsor. The presentation was made at the American Animal Hospital Association convention, Sheraton-Palace Hotel, San Francisco, May 9, 1957.

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CLINIC

CLIFFORD L. McGINNIS, D.V.M.
Peoria, Illinois

TEN years ago it was the fear-biting Cocker Spaniel that added to the unpleasantness of treating dogs. Cocker breeders quickly recognized that the most desirable pets were those possessed of a stable nervous system. In our community the change has been so phenomenal that once again our Cocker puppies are happy, playful little fellows.

Now it is the German Shepherd that is too often mean, vicious, and flighty. The breed seems to be going through the same cycle that followed World War I, when the German Shepherd was in great demand. At that time breeders sacrificed conformation as well as disposition to fill the demand. Since many animals inherited traits not originally characteristic of the breed, demand for "Police Dogs" practically disappeared.

Following World War II, this fine breed again became popular. Each succeeding generation appears to be meaner than the one before. Perhaps we have had just a run of bad dogs lately, but we have begun to suspect every German Shepherd we see of having a vicious temperament.

Misdiagnosis

After treating a black Chow for two weeks for what appeared to be a submaxillary abscess, we finally examined the mouth and discovered a cancerous mass that had almost completely severed the base of the tongue and invaded the entire left side of the pharyngeal region. How could we have failed to look in this dog's mouth for two weeks? Well, in the first place the Chow was not too friendly. On first examination a swelling in the submaxillary region was disclosed by palpation and a too hasty diagnosis was made. Believing the lesion to be an infection of the submaxillary gland, antibiotic treatment was started. The swelling subsided and the animal was discharged on the third day.

Most of these abscesses localize and can be lanced on the second or third day; but since this one subsided so abruptly we discharged the patient. At the end of the week, the dog was returned to the hospital. The area had regained its size when first presented and then ruptured, discharging copious putrid material. This appeared similar to that of some submaxillary abscesses referred for treatment. The area was debrided and the drainage opening enlarged. Antibiotics were administered. The discharge continued for four days, when it was decided that curettage under general anesthesia was indicated. That is when we first examined the mouth. Euthanasia was advised and carried out.

Coughing

There are generally three reasons why dogs cough. Its etiology may be cardiac, post-distemper, or tracheobronchial inflammation. There is little one can do for a cardiac cough. It is easily diagnosed because it occurs ordinarily among the aged; heart is audibly affected usually, and frequently ascites and/or edema of the legs is noted. Treatment is limited to sedation and digitalization.

Cough as a sequel to distemper infection is seldom confused because it follows the acute disease course. It occurs most frequently in young dogs. I know of no treatment effective for this type of cough except time and gradual improvement in general condition. Course is usually two weeks to three months.

Tracheobronchitis is a contagious disease affecting all ages of dogs. The most serious thing about it is that it keeps both the owner and the dog awake at night. Animals are seldom, if ever, acutely ill of the disease. Appetite remains good and affected dogs continue to play. Exercise brings on paroxysm of coughing.

This is a relatively new condition in Peoria that dates from about the time I was in service during 1942 to 1945. When I returned and started to practice again, I had my troubles. Almost every dog I took into the hospital went home coughing. I must have used a barrel of cough syrups but nothing helped. I installed germicidal lamps and that controlled cross infection, so I was again able to hospitalize dogs. I tried using pertussis vaccine but there was too much local reaction. The swelling at the site of injection was worse than the cough. Then I started using catarrhal vaccine, bio #23, from Pitman-Moore Laboratories' human line of biologics. We give 1 to 2 cc. subcutaneously and dispense NaCl gr. 5 with instructions to give t.i.d. Half those affected will stop coughing on the second and third day. If the cough persists, we give a second dose of vaccine on the third day. Occasionally we give a third dose, three to four days later.

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Sedation of Cattle

E. D. BARROWS,* D.V.M.
Cheyenne, Wyoming

Surgical procedures and certain examinations involving cattle are performed easier and with greater speed if the subject stands quietly. Physical restraints in the form of chutes, ropes, and casting devices often leave much to be desired. Many times the means used to restrain the patient only succeed in stimulating fear or anger and can result in violent effort to escape with subsequent increase in movement.

In the course of daily work at the Wyoming Hereford Ranch, it has been found that the use of anavenol K® as a sedative for cattle produces a quieting effect that expedites work and spares the animal injuries associated with the violent threshing movements made in an effort to escape mechanical restraining devices. Even in sedative doses, anavenol K also greatly reduces pain. Combined with local anesthesia it provides chemical restraint along with the alleviation of pain. Following its use many surgical procedures or examinations can be done with a minimum of discomfort to the patient.

We routinely use anavenol K with indicated nerve blocks, infiltration or epidural anesthesia for removal of penile tumors, interdigital fibromas, and extirpation of the eyeball. Use of anavenol K is valuable as a sedative prior to treatment of ocular neoplasms by surgery, cautery, or beta irradiation. It may be used to advantage in those animals that become violent in their resistance to hoof trimming. Following the use of a sedative dose of this useful agent, a four-year-old Holstein bull was dehorned with a minimum of struggling. Procaine anesthesia was used on one horn but not on the other. It is doubtful that an uninformed observer could have differentiated between the anesthetized horn and the other.

In at least one case we have used a 25 cc. dose of anavenol K to control the convulsions in a cow suffering from grass tetany. Following the intravenous injection of the anavenol K, subsequent intravenous medication was much easier. We feel that control of the violent tonic-clonic spasms had a salutory effect upon the outcome of the case. It is certain that control of the convulsions had a good effect upon the bystanders. In one instance, we have collected semen from a bull by electro-ejaculation following intravenous injection of anavenol K. Apparently the semen was unaffected since it was given a high score by another evaluator.

Regarding dosage, 40 cc. intravenously is given routinely to each animal. In rare instances, a large cow may require 5 to 10 cc. more. Our experience has been that bulls require somewhat more than cows. Whether any additional amount need be given must be determined following observation of the effect of the initial injection. Although 40 cc. is given routinely to cows four years of age and older, less than that amount is given to younger, smaller animals or animals in poor condition or flesh. In the case of the younger, smaller animal 20 to 30 cc. may be given and the effect observed. An additional amount may be given if desired sedation is not achieved with the smaller dose. Since most of our work is done on animals while they are standing in a chute, we prefer minimum doses since a slight overdose might result in sedation or anesthesia to the point that the animal might go down in the chute. Even should this occur, it should be of little consequence other than the inconvenience involved.

Speeds at which injections have been made have varied. Earlier injections required just over a minute for delivery of 40 cc. Other injections have been made in just over 5 seconds. The average for a 40 cc. injection is between 10 and 15 seconds. Our experience seems to indicate that speed of injection is not important and that no harmful effect will result from rapid injection. For animals that tend to struggle against any restraint, rapid injection is preferred. Injections are made using a 40 cc. metal syringe with rubber plunger and a 15 gauge, 1½ in. needle. Both syringe and needle must be absolutely dry.

Sedation is immediate following injection and lasts from 30 minutes to an hour. Some patients exhibit a staggering gait even after an hour but are able to walk without falling if they are not hurried. The fact that the patients retain their footing can be important if they are in a chute.

Movement by the patient during the injection may result in some of the material being deposited outside the vein. Apparently this is of no consequence. We have seen no tissue slough or severe reaction following such mishaps.

To date we have had no accidents, nor

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*Veterinarian, Wyoming Hereford Ranch.

have we observed any undesirable after effects. The material has been employed on some 50 females and five bulls. The results obtained were superior to anything used in the past. Since there is no period of excitement during the injection and no slough following accidental deposit of the material outside the vein, advantage of anavenol K over chloral hydrate is readily apparent.

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Quarantine Suspect Stock

From a strictly economic standpoint, not considering its significance as a disease transmissible from animals to man, leptospirosis of cattle has been estimated to be the third most serious disease condition of cattle being exceeded only by brucellosis and mastitis. In different parts of the United States it has been diagnosed both serologically and bacteriologically in some herds to the extent of from 4 to 34%. The serological test is similar to the brucellosis test. A good antigenic immunizing agent is reasonably effective when used on nonaffected animals — it is valueless for those already carrying *L. pomona* infection. Because of the somewhat general prevalence of the condition it is recommended that recently purchased cattle be tested before being added to the herd.

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Ornithosis and Leptospirosis

(Continued from page 338)

it behooves all concerned; physicians, veterinarians, local and state health officials, and plant management to be on the alert should this disease become an occupational hazard in poultry processing plants and a threat to the public health.

NOTE: *Acknowledgement is made of the assistance given by the staff of the Venereal Disease Control Section, N. C. State Board of Health, in the collection of all blood specimens.*

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Newer Treatments for Helminthic Infections

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Alarming increase in the incidence of human psittacosis is due to the lifting of the embargo on parakeets in 1951 and to their booming popularity as pets, according to Dr. W. R. Fifer of the University of Minnesota Hospitals.

EDITORIAL COMMENTS

Antibiotics in Milk

Direct or inadvertent addition of antibiotic drugs to fluid milk to be sold for human consumption or for the manufacture of dairy products may constitute an adulteration within the meaning of section 402 of the Federal Food, Drug, and Cosmetic Act, according to notice in the *Federal Register*.

A Columbia County, Wisc. milk producer paid a fine of $100. and costs in Justice Court, Portage, Wisc., on Jan. 29, 1957 in the first case of this type brought to trial in Wisconsin (*Timely Topics*, May 1957). The charge was offering milk for sale that had been adulterated in that it contained residual antibiotics as a result of treatment of cows' udders. Mastitis in the herd had been challenged with a preparation that contained antibiotics. Further evidence is being collected in Wisconsin, as well as by the F.D.A., to determine what concentrations are likely to be found in market milk and whether a public health problem is actual or potential.

It now appears clear that the low percentage of milk samples now carrying measurable levels of antibiotics can be completely eliminated if these preparations are employed properly.

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Ames Animal Disease Center

Work on contracts for architectural and engineering service for the new Animal Disease Center at Ames, Ia., made last December have progressed to discussion of preliminary drawings of facilities to replace those at Beltsville, Md.

The main building of the center will occupy 12 to 15 acres of land. The remainder of the 318-acre tract near Ames will be used to provide quarters and pasture for the large animal population needed for research. As many as 500 large animals, 2,000 small animals, and 2,000 poultry may be employed at one time in various experimental work and laboratory tests. A scientific staff numbering approximately 500 persons will conduct the manifold investigational and control work planned for the center. Officials have estimated that as many as 25 different problems might be scheduled simultaneously, including costly diseases of all classes of domestic livestock.

Though work on infectious diseases will be considerably expanded, cooperative research projects with the states will be continued. It is not intended that the Ames laboratory shall in any manner replace work being done in regional and state laboratories and experiment stations. Rather, the center, 80% of which will be devoted to research, will support and strengthen cooperative effort with all stations engaged in livestock disease research.

Present plans call for completion of the $16,500,000. project by 1960.

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Increases in Salary Rate for Federal Veterinarians

The U. S. Civil Service Commission has approved, effective June 30, 1957, a request initiated by the Agricultural Research Service for an increase in the beginning salary of GS-7 veterinarians from $5200. to $5335. per annum and an increase in the beginning salary of GS-9 veterinarians from $5440. to $6115. per annum. Veterinarians with less than one year of professional experience will be appointed after June 30 in grade GS-7 at the new salary rate of $5335. per annum. Those with one year or more professional veterinary experience will be appointed after June 30 in grade GS-9 with salary at the rate of $6115. per annum. Moreover, veterinarians initially appointed in grade GS-7 will have excellent opportunities for advancement to grade GS-9 at $6115. per annum upon the satisfactory completion of six months of service and training in the Agricultural Research Service.

Openings for veterinarians exist in both meat inspection and livestock disease control and eradication activities. Veterinarians who are interested in employment in grade GS-7 or GS-9, depending upon their qualifications as indicated above, are encouraged to contact the Personnel Division of the Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.; or they may contact the nearest federal veterinarian in charge of meat inspection or of livestock disease control and eradication activities.

Cleveland, Ohio Host City for A.V.M.A. 1957 Convention

This is the story of Cleveland, the 1957 convention city.

This is the story of the host city and what it offers guests who will attend the forthcoming meeting of the American Veterinary Medical Association, Aug. 19-22, 1957.

The Cleveland of today is a big, busy city — Ohio's first and the nation's seventh. It is nothing like the spot along Lake Erie and the Cuyahoga River that General Moses Cleveland surveyed in July 1796. This spot now is a city of more than a million people, the capital of a great trade empire, and an industrial giant ranking with the greatest in the world.

The Cleveland of today also offers all the attractions of a great metropolis befitting its size and prestige. The cultural and educational institutions, the parks, and the entertainment facilities of Cleveland are among the finest in the world. The beautiful shores of Lake Erie, both east and west of the city, offer a great variety of attractions. And the entire area surrounding the city is one of beauty and interest.

Attractions

As a place to gather, Cleveland offers many attractions and points of interest. It is perhaps more noted as a cosmopolitan community than any similar metropolis its size because of its heterogenous population. The city, whose metropolitan area stretches out from Lake Erie shoreline like a fan, is particularly known for its fine cultural institutions and civic spirit and in 1946 celebrated its sesquicentennial. Largely industrial in character with emphasis on steel and parts manufacturing, Cleveland is the" best location in the nation." The term is a simple statement of a superlative fact — describing the industrial advantages of the Cleveland area's location in the market center of America.

Cleveland's central location assures a good attendance for conventions and one which is easily accessible to a majority of delegates. Half of the population of the United States is within a 500-mile radius and overnight rail

time of the city. Convenient, fast and modern transportation facilities of all kinds are available in and out of the city.

Cleveland's compact layout is another convention advantage. All major hotels, the shopping district, transportation points, amusements, Lake Erie, and the Public Auditorium are all within a few minutes' walking distance. Any point in the city is easily accessible from the downtown area.

At the hub of the city's business activities is the Public Square, a small clearing of land which was purchased by the Connecticut Land Company in 1795 for $1.76 and which is now a modern business and transportation center valued at more than $20,000,000. Towering over the square is Cleveland's familiar landmark, the 52-story Terminal Tower, with an observation room on the 42nd floor that affords a splendid view of the city. It is the seventh tallest building in the world, the other six being in New York. Other parts of the Terminal unit are railroad station, a large department store, a modern hotel and several shops.

Convention Facilities

Building attractions such as this are not confined to the Public Square, however. Many huge office and civic buildings dot the Cleveland scene and have attracted the attention of the whole nation. The Mall, for example, is one of the most ambitious undertakings ever attempted. This plan of grouping public buildings around a spacious 17-acre downtown garden spot represents an investment of more than $40,000,000. The Mall, which overlooks Lake Erie and extends into the heart of the business district, is made up of seven great buildings. America's best equipped convention plant — the $10,000,000. Public Auditorium; the Federal Building; the Public Library; the new Board of Education Building; City Hall; Cuyahoga County Court House; and the lakefront Municipal Stadium seating 83,000 are included in the Mall Development.

Famed throughout the country for its unique facilities and capacity, the auditorium has housed many of the largest meetings and expositions that are annually held in the United States. It is considered to be America's finest and most serviceable municipal auditorium.

The Hall has three theatres, ten halls seating 75 to 500 each and many committee rooms and offices which make it ideal for an all-around convention operation. The main auditorium seats 12,500; the Music Hall seats 3,000 and can be thrown together with the main hall so that 16,000 can watch the action on the 5,000 square foot stage.

Cultural Center

Cleveland also ranks among the nation's outstanding cultural and educational centers. Western Reserve University, comprising various colleges, is one of Ohio's oldest and best collegiate institutions. Case Institute of Technology adjoining the campus of Western Reserve, is among the country's top engineering schools. The two institutions occupy high ground overlooking beautiful Wade Park. Other Cleveland collegiate institutions are John Carroll University and Fenn, Ursuline and Notre Dame colleges.

Gems of the city's cultural treasures are the Cleveland Museum of Art and Severance Hall, both located in University Circle overlooking Wade Park on Cleveland's east side. The art institution is one of the most beautiful museum buildings in America and through its cooperation with the city's schools and colleges has become an essential factor in the educational life of Cleveland Severance Hall is the $2,500,000. home of the Cleveland Symphony Orchestra and has done much to carry the story of Cleveland's education and cultural progress to the rest of the world. Other famous institutions in Cleveland include the Museum of Natural History, the Western Reserve Historical Society Museum, Dunham Tavern, the Public Library, the Health Museum, Brookside Zoo, Nela Park University of Light, and Cleveland Airport.

Entertainment

Cleveland's show houses present the cream of the nation's theatrical talent. In Playhouse Square, with its 12,000 seating capacity, theatres not only offer excellent productions, but they also are attractions in themselves.

With Cleveland in an especially fine mood to welcome guests and members of the A.V.M.A., and with the city's traditionally kind and friendly spirits as a convention host in the offering, all attending this convention are in for a memorable experience.

Aerial view of downtown Cleveland. The compactness of the lake shore city is illustrated here by the proximity of the Terminal Tower (center) and to Municipal Stadium, the home of the Cleveland Indians (upper left). The Public Auditorium, where the A.V.M.A. will meet, can be seen (upper right).

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Dr. Cecil Elder

Dr. Robert L.Anderes

Dr. C. W. Bower

Dr. Jay Reynolds

Kansas State Alumni Honored

Distinguished Service Awards were presented to four outstanding alumni of the School of Veterinary Medicine, Kansas State College, during the 19th annual Conference for Kansas Veterinarians. The awards were presented May 27 at the annual conference banquet.

Honored were Dr. Cecil Elder, '16, now chairman of the Department of Veterinary Pathology at the University of Missouri; Dr. Robert L. Anderes, '34, publisher and editor of VETERINARY MEDICINE; Dr. Charles W. Bower, '18, long time small animal practitioner of Topeka, Kans., now retired; and Dr. Jay Reynolds, '42, general practitioner at Great Bend, Kans.

Doctor Elder has served the profession as an educator since his graduation 41 years ago. He joined the Kansas State faculty as an assistant pathologist immediately following graduation, later leaving that post to accept a commission as a lieutenant in the Veterinary Corps during World War I. From 1919 to 1931 he held the position of research pathologist at the University of Wyoming, Laramie. He has been connected with the University of Missouri since 1931, first as a professor of veterinary science, and since 1947 chairman of the Department of Veterinary Pathology. During the post-war relief effort in China, Doctor Elder served with United Nations teams on UNRRA. He holds memberships in many honorary and professional societies and organization. He is also the author and co-author of a number of technical papers concerned with pathological disorders of animals.

Doctor Anderes entered practice at Evanston, Ill. shortly after graduation in '34, later serving on the professional staff of the Jensen-Salsbery Laboratories in Kansas City. He served six years in the Army Veterinary Corps during World War II, rising to the rank of colonel. After the war Doctor Anderes returned to the private practice of small animal medicine at Kansas City. In 1949 he succeeded Dr. D. M. Campbell as publisher and editor of the professional journal, VETERINARY MEDICINE. Doctor Anderes has contributed a number of technical papers, and has greatly influenced the standard and content of the profession's permanent literature and veterinary journalism. He has also served as president of the Kansas City Veterinary Medical Association and contributed to his community by active interest in the Boy Scout movement. He is a member of the honorary Tribe of Mic-O-Say.

Doctor Bower, a native of Perry, Kans., has contributed almost a lifetime of service to small animal medicine, retiring only recently. He is past president of such organizations as the American Veterinary Medical Association, the American Animal Hospital Association, the National Board of Veterinary Examiners, the Kansas Veterinary Medical Association, and the Missouri Valley Medical Association. While president of the A.V.M.A., Doctor Bower was influential in establishing the present Council on Education. He also established and expanded the public relations program in the A.V.M.A., the film library, the Humane Act Award, and other worthy projects currently in operation in the association. Doctor Bower has also contributed to the permanent literature of veterinary medicine a number of scientific papers.

A Great Bend practitioner since his graduation in '42, Doctor Reynolds was honored with the Distinguished Service Award for his part in promoting veterinary public relations.

He has been active in community development and progress, and has devoted a considerable amount of time in the interest of Kansas State College, generally through activities in the Alumni Association. Doctor Reynolds is a past president of the Kansas State College Alumni Association, and a trustee on the Alumni Board for the Endowment Association. He was vice president of the Kansas Junior Chamber of Commerce in 1949, and holds the Great Bend Junior Chamber of Commerce Distinguished Service Award.

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The Case Family of Veterinarians

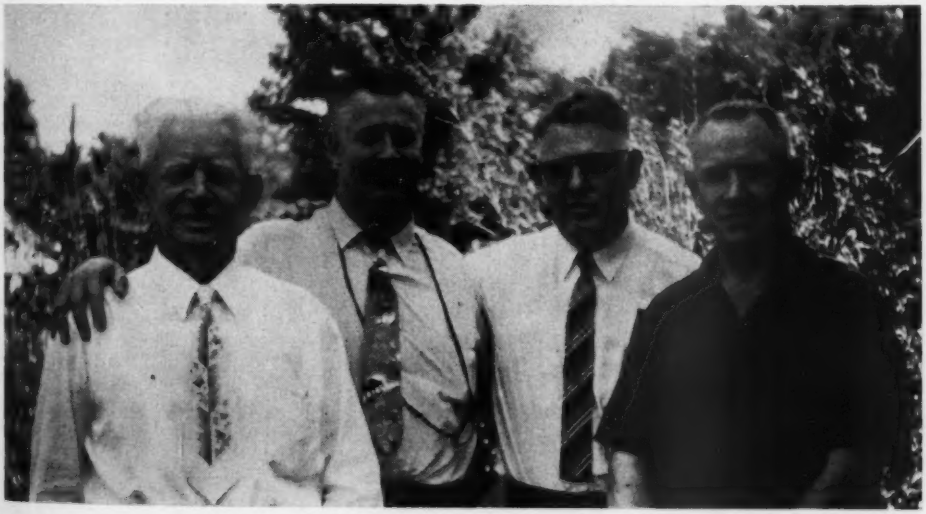
Late in 1955, at the age of 69, Dr. T. A. Case of Nickerson, Kans. suffered a fracture of the right leg after a brush with a Holstein cow he was treating. This occupational mishap did not, however, keep the grand old man of the Case clan from attending the dedication of the Dykstra Veterinary Hospital at Manhattan, Kans. a few months later. During family reunions, Doctor Case and his three sons more or less headquarter at the home of the family's only daughter, Mrs. Virginia Aline of Topeka.

Although the Cases are not Four Horsemen in the traditional meaning of the word, they have long been recognized as the Four Veterinarians from Kansas, one of the few combinations of four veterinarians in one family in the country. Whether they coined it or cribbed it, the Case family isn't sure, but all of the boys are agreed that the most important thing in life next to picking one's own parents is picking the parent's occupation. The senior Case and all three of his sons graduated from the School of Veterinary Medicine, Kansas State College, Manhattan; Dr. T. A. Case in '12; Arthur in '37; Richard in '40; and Glenn in '40. And all of the boys earned a lion's share of their expenses while attending college.

The elder Doctor Case was born near Heizer, Kans., Jan. 5, 1886. He grew up and in turn raised his family at Nickerson, near the geographic center of the state. A graduate of Kansas State Agricultural College, Doctor Case entered practice at Hutchinson, Kans., later serving as Extension Veterinarian for Kansas in Topeka. He retired from that position after his wife became a victim of the "flu" epidemic in 1920.

Arthur, the oldest of the three Case sons, is now professor of veterinary medicine and surgery and associate director of clinics, University of Missouri, School of Veterinary Medicine. Previous to this position, he served in the department of pathology at Ohio State University, College of Veterinary Medicine. Doctor Arthur Case and his wife Annette are the parents of four children, two girls and two boys. Mrs. Arthur Case holds a B.S. and a M.S. degree from Kansas State College.

Dr. Richard A. Case served as staff veterinarian with the North Oak Cliff Hospital of Dr. R. A. Self, Dallas, Texas after his graduation in 1940. During World War II he served



Four veterinarians in one family are, l. to r., Dr. Thomas A. Case, and his sons Arthur, Richard, and Glenn. All hold D.V.M. degrees from Kansas State College, Manhattan.

with the War Department in a number of stations. Later he entered private practice, first at Baltimore, Md., then at Peoria Ill. where he now owns and operates the Southside Animal Hospital on West Garden Street. He and his wife Dorothy, a graduate of the School of Nursing, Kansas State College and Kansas University, are the parents of five children, two boys, and three girls.

The youngest of the Case brothers is Dr. Glenn I., who went into private practice in Oklahoma after his graduation, first at Pawnee, and then at Norman. In addition to duties in B.A.I. Meat Inspection Service, and War Department service, he has been connected with the Affiliated Veterinary Service at Kewanee, Ill. Glenn and his wife Hallie have five children, three older girls and the twins, a boy and a girl, now four years of age. Mrs. G. I. Case is also a graduate nurse, with degrees from Kansas State College and Kansas University.

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Correcting Displaced Bovine Abomasum

Since reported by Moore *et al.*, (*Vet. Med.*, 49:49 [Feb.] 1954) displacement of the bovine abomasum is diagnosed frequently. Veterinarians have operated these cases with general good results but recurrences or failures to accomplished the desired results have been also reported. A variety of stay-suture technics have been described all aimed at fixation of the organ when replaced in the normal position.

Jennings (*Vet. Rec.*, Apr. 13, 1957) believes that the greatest hindrance to the complete transfer of the abomasum from the left to its proper right side of rumen position is the presence of the superficial greater omentum. This tissue is attached to the left longitudinal grove of the rumen and passes underneath the ventral sac to be attached to the greater curvature of the abomasum. In the normal animal this part of the greater omentum is obviously quite long enough to allow the abomasum to lie in the correct position. Nevertheless its presence barely allows the displaced organ to be pushed into the ventro-right lateral side of the rumen and no more, thus leaving the operator in doubt as to whether it will remain thus positioned. If omentum is torn from its longitudinal attachment to the rumen, the abomasum can be pushed under the rumen easily and can even be lifted up on the right side by grasping it with the hand passed over the dorsal surface of the rumen.

In order to avoid excessive hemorrhage the tearing of the omentum is recommended as near as possible to the rumen rather than near the abomasum. Hemorrhage resulting is no cause for alarm. After tearing, the omentum is fixed with a large pair of suitable forceps near the abomasum for identification of the tissue. A hand then passed over and down the right side of the rumen will contact forceps which are grasped and gently retracted to bring first the omentum, then the abomasum to the right and into firm grasp. By these means return of the abomasum to proper position is assured. Dramatic recoveries are reported by the author.

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The Committee for Economic Development has taken the position that the nation would benefit more from tax reduction than from a number of government programs now underwritten by appropriations of funds raised by taxation.

Dr. B. T. Simms, formerly director of the Disease and Parasite Research Branch, and recently named assistant administrator, Production Research, A.R.S., USDA shown receiving the annual Zeta Award presented by Omega Tau Sigma, Auburn, Ala. to selected individuals for outstanding contributions to the veterinary profession. Zeta chapter President Henry W. Hall, Jr., of Brentwood, Tenn. made the presentation.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.

Manhattan, Kansas

Efficacy of Toluene as an Anthelmintic

Repeatedly during recent weeks, requests have been received to discuss the value of toluene as an anthelmintic design to relieved animal of endoparasites.

Toluene (technically methylbenzene) is known commercially as methaside which is available in 7½ to 15 gr. capsules, or in combination with di-phenthane-70 (dichlorophen) it is called vermiplex. Compared with n-butyl chloride it appears to be somewhat more efficient in the handling of hookworms in dogs and cats though lacking this efficiency when ascarids or whipworms are the parasitic forms of concern. The drug is effective in removing ascarids from horses, and at the same time removes many stomach bots. In addition to the dog and cat parasites mentioned, toluene when in combination with di-phenthane-70 and when given after preliminary fasting of 18 to 20 hours, has been reported as an effective taeniacide. For kittens weighing less than 2½ lb. there were noted toxic manifestations, and because repeated administration of toluene is toxic to bone marrow, caution in this respect is advisable. A purgative is not necessary following the use of toluene as it in itself is a mild irritant to the digestive tract so as to increase limited evacuations. The recommended dosage for the horse is 0.1 to 0.2 ml. (1.5 to 3 minims) per pound of body weight; for dogs, puppies, cats, and kittens 0.1 ml. (1.5 minim) per pound of body weight. In horses it is customary to administer it on full feed.

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A University of Pittsburgh report observes that young rats grow faster and larger if during the nursing period they are permitted to feed from their own mother, and in addition, from a foster mother. Likewise, from another source, it is stated that calves a few days of age, born during the cold seasons of the year, when placed in sheds open to the south made better gains on identical rations than those kept in a warm barn.

Hidden Hazard

Medical statistics indicate that for the period extending from 1930 to 1954 inclusive, a total of 82,441 physicians died. Of this total, medical radiologists died on the average 5.2 years sooner than all other physicians. Non-radiology specialists occasionally exposed also had a shorter life span, though not to the same extent as the radiologist. Physicians contend that present safeguards in the use of radiology are entirely adequate, though there must be a much stronger effort to practice the established standards. Veterinarians may well bear these facts in mind in their use of *x*-ray equipment.

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Up-Grading Low Quality Feed for Nonruminants

A research project at the Missouri Agricultural Experiment Station concerns itself with the making of vegetable substances, particularly cellulose, digestible for nonruminants such as poultry and swine. The project, essentially, is to take some of the rumen contents from cattle or sheep, rich in microscopic single-celled organisms, and inoculating this into moistened poor quality foods that because of their high fiber content are not digested by nonruminants, and permitting the subsequent fermentation process. The pH of the fermenting material is kept at a constant level of six and seven by the addition of artificial saliva whenever acidity becomes too high. Vitamin B_{12} is formed during the fermentation process, bacteria die to form protein for the consuming animal, and the fat content was doubled. In other words, the plan is to up-grade poor feeds for nonruminant consumption. The value of this feature of the project in preliminary feeding tests has demonstrated increased gains for swine and poultry. High quality feeds are not in any sense improved by the artificial rumen procedure. It is hoped that funds will be made available to continue this important project for a long enough time to indicate definite conclusions.

VETERINARY NUTRITION

MORRIS ERDHEIM, D.V.M.
Chicago, Illinois

Hemorrhagic Disease

Poultry pathologists have been able to distinguish two kinds of hemorrhagic conditions in the field. One is more commonly found in broilers. This is characterized by petechiae in the skeletal muscles. It was thought that the use of excessive amounts of sulfonamides in the treatment of coccidiosis could trigger the onset of symptoms. There was also some reason to believe that the addition of vitamin K to the feed would help control the condition.

The condition assumed serious proportions in the broiler industry some two or three years ago. It is relatively uncommon today. It came and left the scene mysteriously.

The other hemorrhagic syndrome is more often seen in turkey flocks. This is manifested by rupture of the aorta and bleeding into the abdominal cavity.

The cause for this condition is unknown. Recent work at the University of Wisconsin may point to a possible cause.

A substance found in sweet pea seeds can produce similar symptoms. The substance called BAPN (beta amino-propionitrite) will cause death by internal bleeding in turkey poults, when fed at a 0.12% level. Much lower levels (0.04%) killed half the dosed birds in 26 days.

It remains to be shown, however, just where the poults pick up the BAPN (or related compound) under normal field conditions.

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Molybdenum in Poultry Feeds

Working on the identity of unidentified factors in poultry nutrition has led scientists into the area of trace minerals. There has been much research on the speculation that these much discussed unidentified factors are, at least in some part, of mineral composition. The mineral currently receiving most publicity is molybdenum.

Couch of Texas A. & M. has reported consistent growth response in birds when 0.25 gm. of sodium molybdate (source of molybdenum) is added to a ton of feed. Other workers report that they get a similar response under some conditions.

If feed manufacturers are encouraged to include a source of molybdenum in poultry feeds, the possibility of contamination of cattle feeds should be an important consideration. *Small quantities of molybdenum produce toxic symptoms in cattle.* Pasture grasses with as little as 20 parts per 1,000,000 are dangerous. Veterinary practitioners would do well to check with feed manufacturers and distributors in their areas. If molybdenum is to be used in the poultry feeds, a friendly warning about the potential danger of cattle feed contamination can be helpful to all concerned, and should be appreciated as a service.

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New Ketosis Treatment

The administration of sodium lactate (soluble) and calcium lactate by mouth results in a marked increase in rumen propionic acid, according to a report from the University of Maryland (Bulletin A-87, April, 1957). Sodium lactate (soluble) produces a much greater rise in the blood sugar level than calcium lactate. A 3 lb. dose of sodium lactate causes a three-fold increase in blood lactic acid, while calcium lactate does not effect blood lactic acid levels.

Apparently, the soluble lactates increase blood sugar because the lactic acid is readily absorbed into the blood stream, and subsequently converted into blood sugar.

Field tests by the Maryland workers verified these findings in normal cows. Cows with ketosis recovered rapidly following the administration of soluble sodium lactate.

Unfortunately, the soluble sodium lactate is laxative. The mixing of both sodium and calcium lactate appears to diminish this effect. Whether this technic will be effective as a preventive is yet to be demonstrated.

For treatment, the following program has been followed with some success. An initial dose of 1 lb. of the mixture of sodium and calcium lactate is followed by a ½ lb. dose twice a day for not to exceed seven days.

THE PRACTITIONER'S LABORATORY

WILLIAM L. SIPPEL, B.S., V.M.D., M.S., Ph.D.
Kissimmee, Florida

Tests for Canine Pancreatitis

The diagnosis of pancreatitis of dogs should not present much difficulty to the practitioner when it appears in the advanced form so well described by Archibald and Whiteford.[1] Those symptoms include: A voracious appetite with a paradoxical loss of weight, bulky, foul smelling, persistent loose stools, and droplets of fat around the rectum. On microscopic examination of the stool, many fat globules will be noted. However, in the early stages when uncontrollable diarrhea is the most prominent symptom, diagnosis is more difficult. At this time a simple test for pancreatic function will be of value. This is most readily accomplished by tests for pancreatic enzymes.

The enzymatic functions of the pancreas are concisely reviewed by Mark and Burleigh.[2] Briefly, it furnished enzymes for protein, carbohydrate, and fat metabolism.

More complicated tests for determining the presence of these ferments include the vitamin A absorption test. This vitamin being fat soluble depends on fat digestion for absorption. Other tests are those for serum lipase or amylase, urinary amylase or ascertaining the level of these enzymes in the duodenal secretion following an injection of secretin. Hutyra, Marek and Manniger[3] describe Schmidt's nuclear test whereby a small bit of muscle is hardened in alcohol, washed in water, wrapped in gauze and administered orally to the dog. After retrieving from the stool, the muscle is sectioned, stained with hematoxylin and examined for nuclei. These will be present if the pancreatic enzyme trypsin has not been secreted, indicating malfunction of the pancreas.

Another test for the action of trypsin in duodenal juice on protein (gelatin) is described by Gradwohl.[4] This test measures the millimeters of gelatin in a capillary tube digested by the duodenal juice in 48 hours.

A rapid and simple test for the presence of protein digesting enzymes in the stool can be performed as follows:*

1. Obtain a small amount of feces (about 10 gm.) and suspend in two volumes of water.
2. After thorough mixing, spin down in a centrifuge or allow to settle.
3. Draw off about two milliliters of the supernatent fluid and place on the emulsion (dull) side of a discarded film (*x*-ray or photographic).
4. Allow to stand for one hour and wash off under flowing tap water.

In the presence of proteolytic enzymes from the pancreas, the gelatin will be dissolved, leaving a hole. (Fig. 1). Failure of the test material to digest the gelatin indicates a lack of proteolytic enzyme and pancreatic malfunction. The stool should then be checked for excessive fat droplets as additional confirmation.

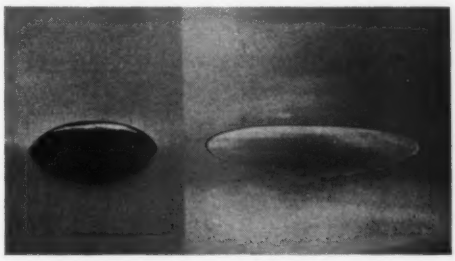

Fig. 1. Close-up of *x*-ray film illustrating drop of water (left) and hole in emulsion (right) resulting from digestion of gelatin layer by enzymes in canine fecal suspension.

Controls and Precautions

The same procedure using the supernatent fluid from a suspension of the stool of a normal dog and also a drop of the diluting water should be placed on the same film as controls.

Using standard conditions, this technic lends itself well to semi-quantitative analysis by making serial two-fold dilutions of the suspension and using a drop of each dilution on film to determine the end-point.

The presence of proteolytic enzymes from the intestinal mucosa will not interfere with this test. These ferments are only weakly

*This test is not original with the author but reference to it can not be found.

proteolytic and act on the products of pancreatic trypsin digestion. (Best and Taylor).[5]

The time required for the supernatent from the stool of different dogs to digest the gelatin varies widely. Some stools will digest the gelatin layer completely in ten minutes whereas others require a full hour. The character of the diet is thought to affect the rapidity of the reaction. A freshly passed stool, or preferably a rectal specimen, is best for the test. Avoid dry hard stools or those that have become partly dried in the sun. The film should be examined carefully prior to use to be sure the emulsion layer is in good condition.

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4. Gradwohl, R. B. H., Clinical Laboratory Methods and Diagnosis. Third ed., St. Louis, C. V. Mosby Co., 1943, vol. 1, p. 841.
5. Best, C. H., and Taylor, N. B., The Physiological Basis of Medical Practice. Fifth ed., Baltimore, 1950, p. 535.

▾ ▾ ▾

Second International Veterinary Short Course

The Veterinary College of Vienna extends an invitation to American veterinarians to attend the Second Annual Post-Graduate Course for Veterinary Surgeons, at Vienna, Oct. 2-5, 1957.

The four-day program will deal with some current problems presented practitioners in the United States and include in part: Circulatory diseases, piglet anemia, radioactive isotopes, hygiene and prophylaxis on the farm, mixed feeding stuff, parasitological problems in cattle, infectious disease control by modified vaccines, anesthesia, and others of no less prominence.

Detailed programs and application forms are available from: Tierärztliche Hochschule Wien (Kurburean) Wein III., Linke Bahngasse 11, Osterreich, (Austria).

▾ ▾ ▾

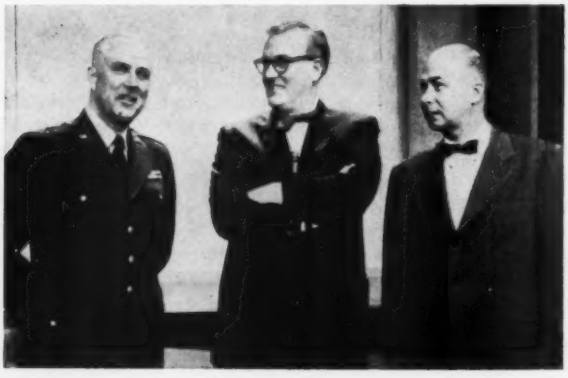
III. Symposium on Reproduction and Infertility
Ft. Collins, Colorado—July 1-3, 1957

Colorado State University (formerly Colorado A. & M. College) announces The III Symposium on Reproduction and Infertility and extends a cordial invitation to all interested veterinarians. This Symposium is planned as a continuation of the I Symposium held at Iowa State College (July 7-9, 1953) and of II held at the Centennial Celebration of Michigan State University (June 27-29, 1955). It will be sponsored jointly by Colorado State University, College of Veterinary Medicine, and the state Agricultural Experiment Station.

An outstanding group of speakers have been engaged to discuss latest research in the following area:

1. Disease of Reproduction.
2. Avian Physiology.
3. Steroid Physiology and Therapy.
4. Artificial Insemination.
5. Field Application.

For further information and detail program address: Dr. F. X. Gassnex, Chairman, Committee on Arrangements, College of Veterinary Medicine, Colorado State University, Ft. Collins, Colo.



A segment of Dave Garroway's NBC-TV Today show recently was devoted to advances in veterinary medicine. Participating in the discussion on animal health were Brig. General Wayne O. Kester, president of the American Veterinary Medical Association, left, and Dr. J. Lavere Davidson, right, director of the Department of Veterinary Medicine, The Upjohn Company, Kalamazoo, Mich.

Read the story of how the veterinary profession has progressed through the ages . . .

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Evolution of the Veterinary Art

by J. F. Smithcors, D.V.M., Ph.D.

Antiquity

Paleopathology and remnants of writings in antiquity give conclusive evidence that veterinary medicine took form, gathered speed, and moved ahead slowly during this milieu, particularly in India.

Rome

If seeds of enlightenment were passed into Roman hands, they were soon embalmed with superstitutions, some of which haunt the art today. The elder Pliny, his imitators and rivals, have provided concrete identification of veterinary practice during this period.

The Dark Ages

Medical myth and barbarism dominated the dark ages. Superstitions rose like barricades on the road to progress. The lamp of learning flickered, then went out, and veterinary medicine passed into the hands of cow-leeches, farriers, and charlatans.

Animal Plagues

Animal plagues devastated the whole of the continent, as though nature were bent on genocide of European man. How veterinary medicine reacted to the challenge provides a phase of history previously ignored.

Veterinary Progress

Diffusion of knowledge to the general level through veterinary colleges started the bitter struggle to replace the ignorant quack and the self-styled horse doctor. It is a story so strange it borders on the unbelievable.

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WANTED: Veterinarian to assist in a general practice in Wisconsin. Contact P. B. Swart, D.V.M., Route 2, Waukesha, Wisc.

Hazard of X-ray Exposure

Hazard of medical *x*-ray exposure has been reevaluated upward, according to scientists studying the problem for the National Academy of Sciences (*Medical News*, May 6, 1957). All branches of the medical profession are warned to renew efforts to reduce exposure by using "fast film, electronic amplification, shielding, filtration, and a conservative approach to radiology." Stressed is the opportunity for reducing radiation to the gonads through adequate use of aluminum filters and proper focusing cones.

In reports being circulated privately among radiologists, the average gonadal dose received during a 30-year period from medical and dental *x*-rays has been revised upward from 3 r to 4.6 r, or 70% more radiation than the total estimated exposure received from all other sources. Fallout radiation exposure occasioned by the testing of atomic devices throughout the world remains at 1/10 of 1 r.

Dr. H. Bentley Glass, Johns Hopkins University geneticist, stated that the Public Health Service's dismissal of personal exposure records as impractical was "premature."

▼ ▼ ▼

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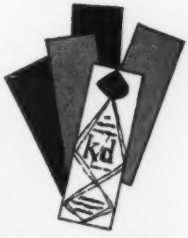

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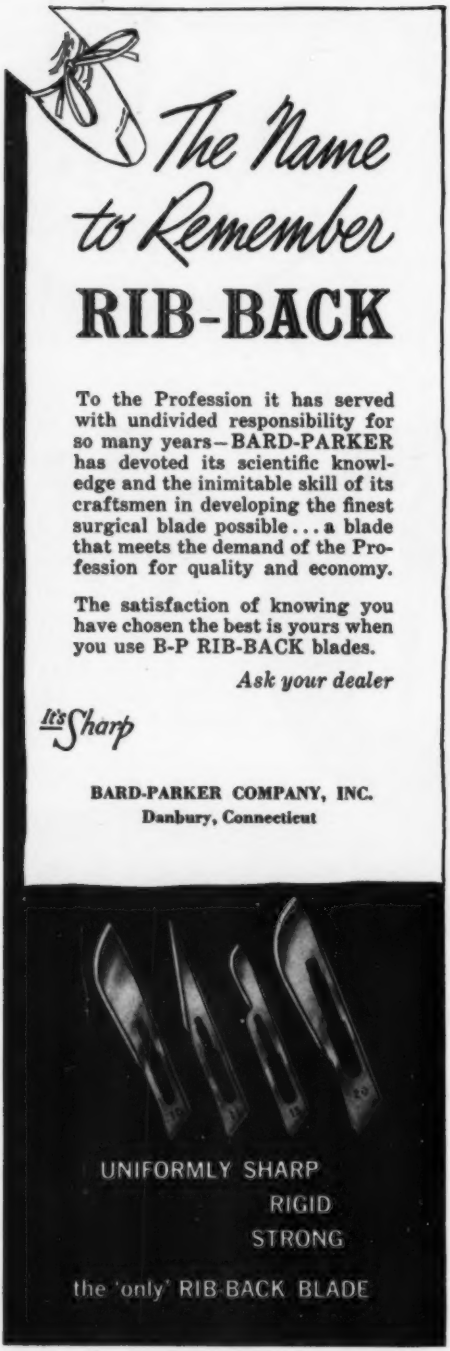
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British Concern Announces Effective Anthelmintic for Lungworms

A team of research workers of the Pharmaceuticals Division of the Imperial Chemical Industries Ltd., England, announced in Britain and the United States simultaneously on May 27, 1957, discovery of a treatment for lungworm infection in cattle, sheep, and swine.

The chemical, cyanacethydrazide, which is related to isonicotinic acid hydrazide employed in therapy in tuberculosis, has been known for some years. Its discovery is claimed as a conquest of a group of parasites against which no effective treatment has hitherto been offered. The product has been designated "Helmox" by the British concern.

Losses sustained annually in the United States due to inroads of these parasitic species are well known to researchers and practitioners. Mortality losses, though significant, are relatively small compared to losses in production of meat, hides, milk, and wool.

Administration of this new anthelmintic does not kill adult worms in the bronchi or trachea, but forces them to move into the anterior respiratory tract where they may be coughed up, swallowed, and destroyed.

Extensive testing and field trials are being conducted in this country by competent parasitologists in state experiment stations, college veterinary clinics, and the USDA. Results will be coordinated by the Ft. Dodge Laboratories, Ft. Dodge, Ia., and pending confirmation of British claims for the agent, federal approval will be requested.

The Ft. Dodge Laboratories will initiate these preliminary steps prior to release of the new agent to the profession.

▾ ▾ ▾

The Fromm interests of the Fromm Laboratories, Inc., Grafton, Wisconsin, have acquired complete control of all of the firm's capital stock, according to general release dated May 29, 1957.

The announcement marked the end of prolonged negotiations with the heirs of the late Dr. Robert O. Green, former virologist of the firm, who died in 1947.

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Dosage: Average dose (for 20 to 30 lb. dog): *orally*—50 to 100 mg. two or three times daily, as indicated; *parenterally*—2 cc. (50 mg.). Paxital may be administered intravenously, intramuscularly or subcutaneously. Occasionally, an additional 2 cc. may be required to obtain the desired clinical response. Tranquilization is obtained usually within 45 minutes following oral administration. Onset of action following parenteral administration is more rapid.

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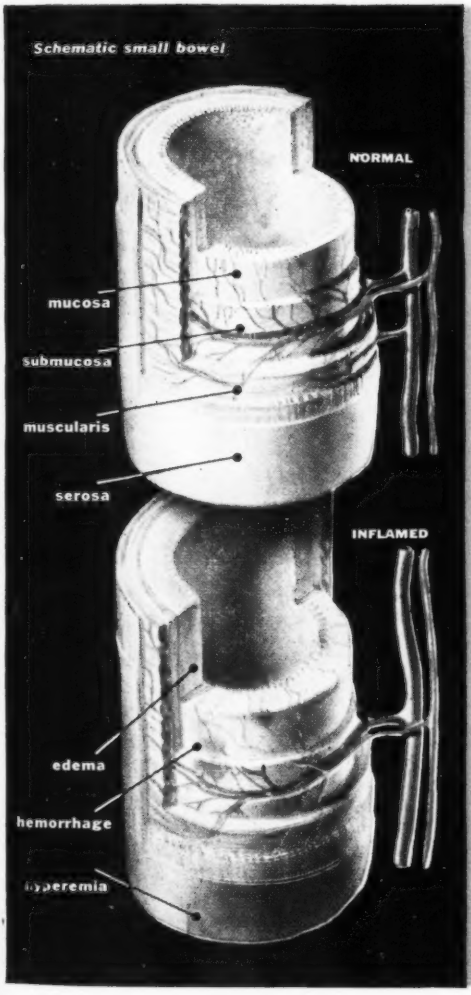

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REFERENCES: 1. Mosier, J. E.: Vet. M. 50:605 (Nov.) 1955. 2. Belloff, G. B.: Calif. Vet. 9:27 (Sept.-Oct.) 1956. 3. Pollock, S.: J. Am. Vet. M. Ass. 129:274 (Sept.) 1956.

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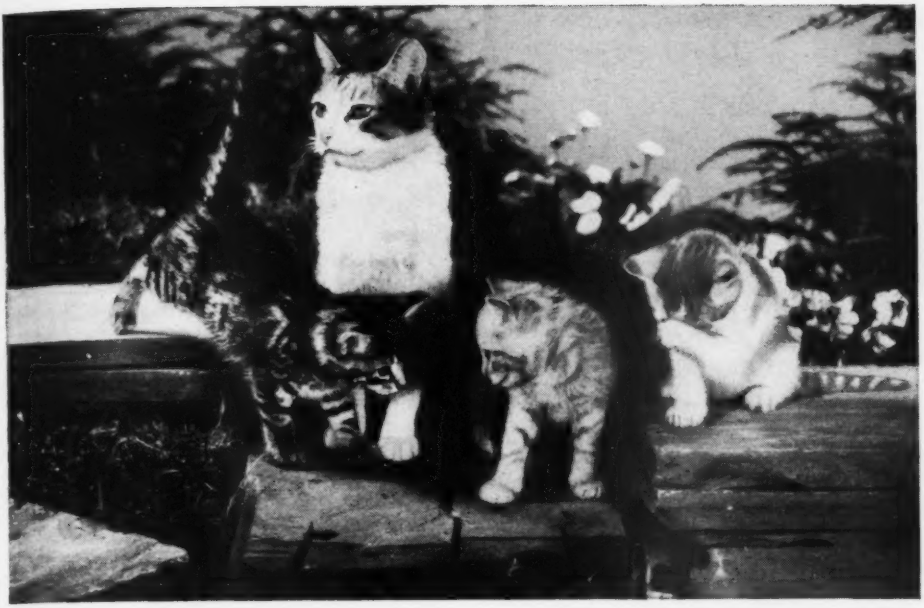

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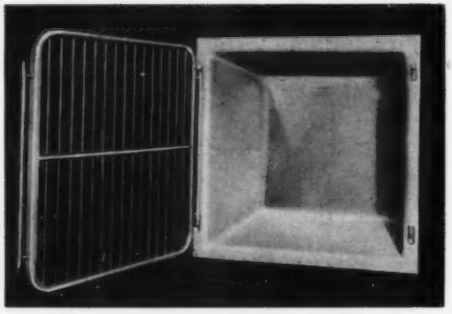

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Retirement of Sir Thomas Dalling

Sir Thomas Dalling, one of the world's truly great veterinarians, has reached the end of yet another of the many phases of a brilliant and diversified career. On attaining the age of 65 he has retired from his position as senior veterinarian with the Food and Agriculture Organization of the United Nations. His services will continue to be available in a consulting capacity.

There is virtually no branch of veterinary science which has not at one time or another claimed his attention. Not only has he made outstanding contributions in the fields of veterinary pathology, bacteriology, virology, and immunology, but he has had a profound influence on veterinary administration and education, and the field of control of disease in many countries of the world.

His career has divided itself into a number of clearly defined phases, in each of which he has attained eminence. The profession to which he has in a unique sense devoted his life, has regarded him with pride and gratitude during his 43 years as a veterinarian.

(Continued on page XLIV)

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The earliest, formative stage, came in the few years following his qualification as Member of the Royal College of Veterinary Surgeons in 1914. On leaving the Royal (Dick) Veterinary College, after a brilliant scholastic career, he went first into practice in the Midlands and then into the Royal Army Veterinary Corps. He served in France where he had charge of a number of laboratories. It was this wartime service which first attracted him to research. His experience in establishing and operating field laboratories, the preparation of autogenous vaccines for horses, and the use of the then famous Reading Bacillus, whetted his appetite for investigational work.

Research Work

In 1937, at the age of 44, Dalling was elected to the Professorship of Animal Pathology at Cambridge. In this capacity he acted also as Director of the Institute of Animal Pathology, and during the next five years he initiated and supervised much valuable research and investigational work in such fields as tuberculosis and the use of tuberculin, fowl paralysis, and infertility in cattle. Under his inspired leadership the Institute played an ever-increasing part in the elucidation of problems concerned with the diseases of animals.

Throughout all the phases of his active and colorful life, Dalling has found time to sit on innumberable committees and councils. He helped the work of the National Veterinary Medical Association, serving with distinction on many of its committees. He has held office in the Royal Society of Medicine, the Veterinary Research Club, the Medical Research Club, the Agricultural Research Council, and the International Veterinary Congress. For a period of two years he served as President of the Royal College of Veterinary Surgeons.

The character and high standard of his scientific investigational work would alone insure a worthy place for the name of Thomas Dalling in the records of the profession which he has served so nobly. With a series of brilliant teams of coworkers over the years — the names of Gaiger, Gordon, Mason, Glenny, Okell, Pugh, Bateman and MacIntyre come readily to mind — he carried out work with the anaerobes, the preparation of anatoxine and anacultures, leptospirosis, canine distemper, cat enteritis, a wide field of poultry conditions and tuberculosis of domestic animals. While much of his work has been of outstanding economic importance, a great deal of it has

(Continued on page XLVI)

Research Reveals Highly Effective Anthelmintic for Cattle

The results of recently intensive clinical research revealed an anthelmintic that is highly effective in cattle. Individual animals were confined in special stalls and administered different phenothiazine drench formulations for testing. All urinary and fecal excreta were recovered and each excretion was individually analyzed chemically to determine how much of the dose went into the digestive tract and amount of the dose available for killing worms. Dosages were given on an identical basis.

GREATER CONCENTRATION

Results obtained from this modified formulation were better than that of unmodified drenches generally used. Tests show that modified formulations produced on the average 6 to 8 times more phenothiazine in the digestive tract in a shorter period of time than other drenches. For example, peak percentages (above 1%) of the modified chemical were obtained in only 17 hours post treatment while the average of unmodified formulations returned a peak percentage of less than .2% 40 hours or later post treatment.

All statements regarding the effectiveness of the above tests are backed by documented experimental data.

Many veterinarians are using this modified formula under the professional label Pro-Brand Improved Cattle Wormer which is sold only to veterinarians. A brochure is available on request. For details write to Pro-Brand Products Company, P. O. Box 4186, Fort Worth, Texas.

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New Distemper-Hepatitis Vaccine

The Pitman-Moore Company, Indianapolis, Ind., announce release and availability of a new vaccine combining living viral agents of both canine distemper and infectious canine hepatitis. The product, designated virovax D-H® is a combination of canine distemper vaccine, modified live virus, chick embryo origin, and canine infectious hepatitis vaccine, modified live virus, tissue culture origin. Virus vaccines are prepared, mixed, freeze-dried and packed with diluent to make a 2 cc. dose for either subcutaneous or intramuscular injection.

Careful control and extensive testing of the product have assured safety against reversion of both modified viruses to virulence, according to manufacturer's claims. Potency trials reveal a high grade immunity to challenge by both disease producing agents. Promised is lengthened duration of immunity confered to hepatitis over that possible by avirulent vaccine.

Methods of administration, recommended age for vaccination, and other details are included in an attractive brochure in which are included tables summarizing experimental results with the new product.

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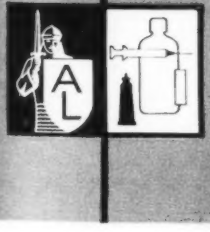

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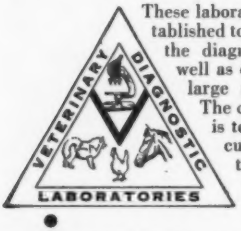

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(Continued from page XLIII)

been primarily aimed at the relief of suffering in domestic animals and pets.

Professional Honors

Honors have come thick and fast, and lie lightly on the shoulders of this modest and unassuming man. He is a Fellow of the Royal College of Veterinary Surgeons, M.A. (Cantab.), LL.D. (Glasgow), D.Sc. (Belfast), D.Sc. (Bristol), D.V.M. (Hanover) and F.R.S.E. He is an honorary member of a number of Divisions of the British Veterinary Association and of innumerable veterinary associations abroad. He has been awarded the Victory Medal by the Central Veterinary Society, the Dalrymple-Champneys Medal, the Sir Thomas Baxter Medal, and the John Henry Steele Medal.

In 1951 he was knighted by King George VI in recognition of his meritorious public and professional services.

Sir Thomas Dalling has played a remarkable part in the establishment of international methods for the control of disease. His work in the FAO program for the control and eventual eradication of rinderpest has been a major contribution to this important project. He is the architect of the European Commission for the Control of Foot-and-Mouth Disease which is already achieving notable results. For many years he has been intimately associated with the Office Internationale des Epizooties and, under his guidance, FAO and OIE are cooperating closely and successfully in many common fields of endeavour.

Sir Thomas Dalling has no desire or inclination to look back for long. Indeed, it is typical of the man that he regards the future with an unimpaired eagerness and sense of adventure. His friends and colleagues all over the world will join at this time in wishing him many years of useful work and effort, not only for the great organization, which he has served and is continuing to serve, but also for the profession whose interests and furtherance have been his principal concerns throughout life.

▼ ▼ ▼

Immunization of dairy cows against bacterial and viral agents that attack children, in theory at least, has considerable possibilities. Protective antibodies in milk consumed from such immunized cows would likely afford sufficient passive immunity to be effective, according to allergist Dr. Wm. B. Sherman.

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Dr. William M. McLeod

1892 - 1957

Dr. William M. McLeod, 65, head of the Department of Anatomy, School of Veterinary Medicine, Kansas State College, Manhattan, died suddenly of a heart attack in his laboratory May 6, 1957. He had suffered a heart attack early this year, and had been hospitalized for some time. However, he had resumed part of his duties within the past month.

Dr. Wm. M. McLeod

Doctor McLeod was recognized as one of the top veterinary anatomists in the country. He has been a member of the faculty of the Kansas school since 1919, and would have been retired from administrative duties July 1 this year, under a Board of Regents ruling requiring that individuals give up administrative posts at 65 years of age.

A native of Williamsburg, Ia., where he was born Feb. 23, 1892, Doctor McLeod graduated from Belle Plaine, Ia. high school in 1911, and received his D.V.M. from Iowa State College in 1917. He served 18 months in the Army Veterinary Corps as a 1st lieutenant during World War I. He was a member of the American and Kansas Veterinary Medical Associations and of such honorary organizations as Phi Kappa Phi, Sigma Xi, and Gamma Sigma Delta. Survivors include his wife, three daughters, and six grandchildren.

▼ ▼ ▼

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Death Erroneously Reported

The June 1957 issue of VETERINARY MEDICINE reported the death of Dr. Claude Cox, Watsonville, Calif., CVC '13. This was in error, and we are pleased to report that the latest information on Dr. Cox indicates he is in good health.

▼ ▼ ▼

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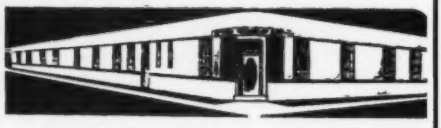

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MEETING CALENDAR

Michigan State Veterinary Medical Association. Annual Meeting. Leland Hotel, Detroit, Mich., June 26-27, 1957. Dr. Paul V. Howard, 4011 Hunsberger N. E., Grand Rapids 5, Mich.

Maryland State Veterinary Medical Association. Summer Meeting. George Washington Hotel, Ocean City, Md., June 27-28. John D. Gadd, Cockeysville, Md., secretary-treasurer.

Kentucky Veterinary Medical Association. Forty-sixth Annual Meeting. The Brown Hotel, Louisville, Ky., July 15-16, 1957. Dr. Robert H. Singer, 136 Shawnee Place, Lexington, Ky., secretary.

Iowa State College. Annual Conference for Veterinarians. Memorial Union, Iowa State College campus, July 16-17, 1957. M. S. Hofstad, program chairman.

California State Veterinary Medical Association. Sixty-ninth Annual Convention. Hotel Miramar, Santa Barbara, June 17-19, 1957. Charles S. Travers, 3004 16th St., San Francisco, executive secretary.

Alabama Polytechnic Institute. Fiftieth Annual Conference for Veterinarians. Auburn, Ala., July 21-24, 1957. Dr. R. S. Sugg, dean.

Canadian Veterinary Medical Association. Ninth Annual Meeting. Hotel Georgia, Vancouver, B.C., July 22-24, 1957. Dr. J. Archibald, Ontario Veterinary College, Guelph, Ontario, vice-president.

American Veterinary Medical Association. Annual meeting. Cleveland Auditorium, Cleveland, Ohio, Aug. 19-22, 1957. Dr. J. G. Hardenbergh, 600 S. Michigan Ave., Chicago 5, Ill., executive secretary.

Washington State Veterinary Medical Association. Forty-second Annual Convention. Monticello Hotel, Longview, Wash., Sept. 9-10, 1957. Dr. William F. Harris, 1102 E. Main Street, Puyallup, Wash., secretary.

New York State Veterinary Medical Society. Annual Meeting. Hotel Statler, Buffalo, N. Y., Sept. 11-13, 1957. Joan S. Halat, 803 Varick St., Utica, N. Y., secretary.

New England Veterinary Medical Association. Twenty-third Annual Meeting. Equinox House, Manchester, Vermont, Oct. 6-9, 1957. Dr. C. Lawrence Blakely, 180 Longwood Ave., Boston, Mass., secretary.

Florida State Veterinary Medical Association. Annual Meeting. Fort Harrison Hotel, Clearwater, Fla., Oct. 13-15, 1957. Dr. Robert P. Knowles, 2101 N. W. 25th Ave., Miami 42, Fla., secretary.

University of Missouri. Thirty-third Annual Short Course for graduate veterinarians. Columbia, Mo., Oct. 14-15, 1957. Dr. Cecil Elder, chairman.

Illinois Conference and Extension Short Course for Veterinarians. University of Illinois, College of Veterinary Medicine, Oct. 17-18, 1957. Dr. L. E. Boley, University of Illinois, chairman.

Eastern Iowa Veterinary Association. Forty-fourth Annual Meeting. Hotel Sheraton-Montrose, Cedar Rapids, Iowa, Oct. 17-18, 1957. Dr. F. E. Brutsman, Graer, Iowa, secretary.

Southern Veterinary Medical Association. Annual Meeting. Roanoke Hotel, Roanoke, Va., Oct. 27-30, 1957. Dr. A. A. Husman, P. O. Box 91, Raleigh, N. C., secretary.

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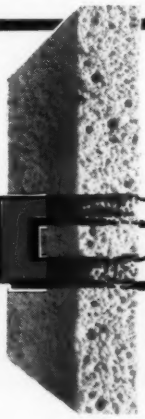

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—DEATHS OF VETERINARIANS—

M. J. Hammond, Broughton, Kans., CVC '08, died recently.

John M. Handley, Thornville, Ohio, OSU '08, died recently.

Herbert F. Harms, Pearl River, N. Y., NYS '08, Oct. 9, 1956.

Clarence J. Howard, Carlisle, Ind., IND '07, died recently.

Roy Huckleberry, Whitestown, Ind., IND '16, died recently.

Arthur O. Hughes, Mangum, Okla., KCV '10, Dec. 18, 1956.

Rufus T. Kennedy, Columbus, Ohio, OSU '11, died recently.

Christopher C. Kinsley, Oakley, Kans., KVC '05, died recently.

LeRoy D. Knight, Port Jervis, N. Y., AVC '14, died recently.

A. M. Kriens, Fontanelle, Iowa, KCV '18, died recently.

Ray S. Long, Tampa, Fla., COL '16, Nov. 26, 1956.

Jesse C. McKee, Litchfield, Minn., ONT '10, died recently.

James A. McLeish, Montreal, Que., died recently.

Charles D. McMurdo, San Jose, Calif., AVC '89, died recently.

Audry W. Miller, St. Louis, Mo., IND '13, died recently.

Thomas I. Miller, Decatur, Ill., CVC '07, died recently.

William J. Moersfelder, Bronx, N. Y., COR '23, died recently.

Burke E. Moore, New Bern, N. Car., USC '20 died recently.

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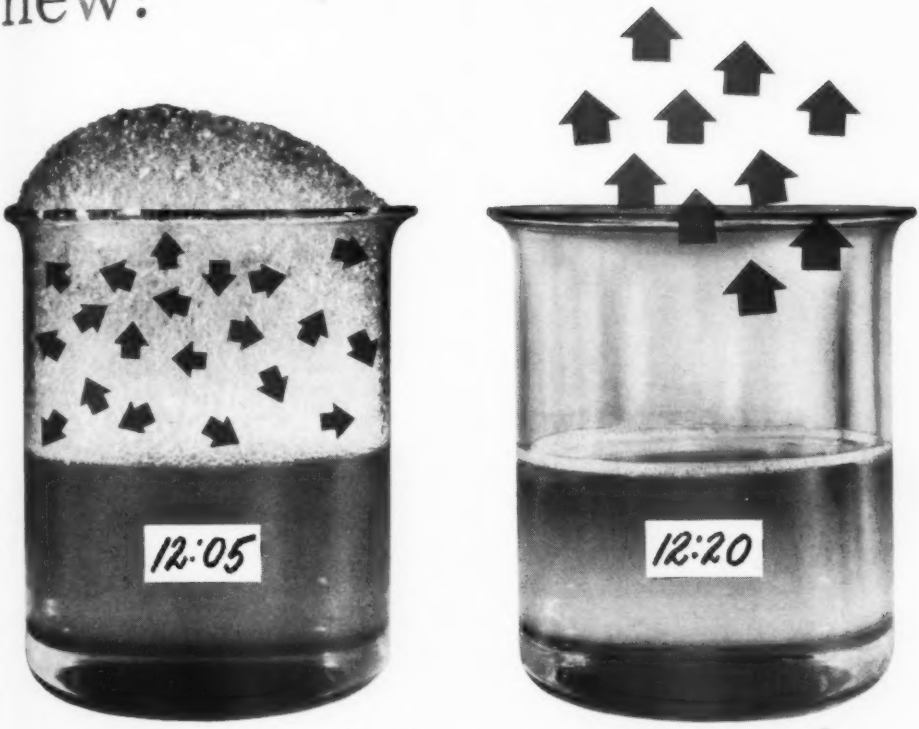

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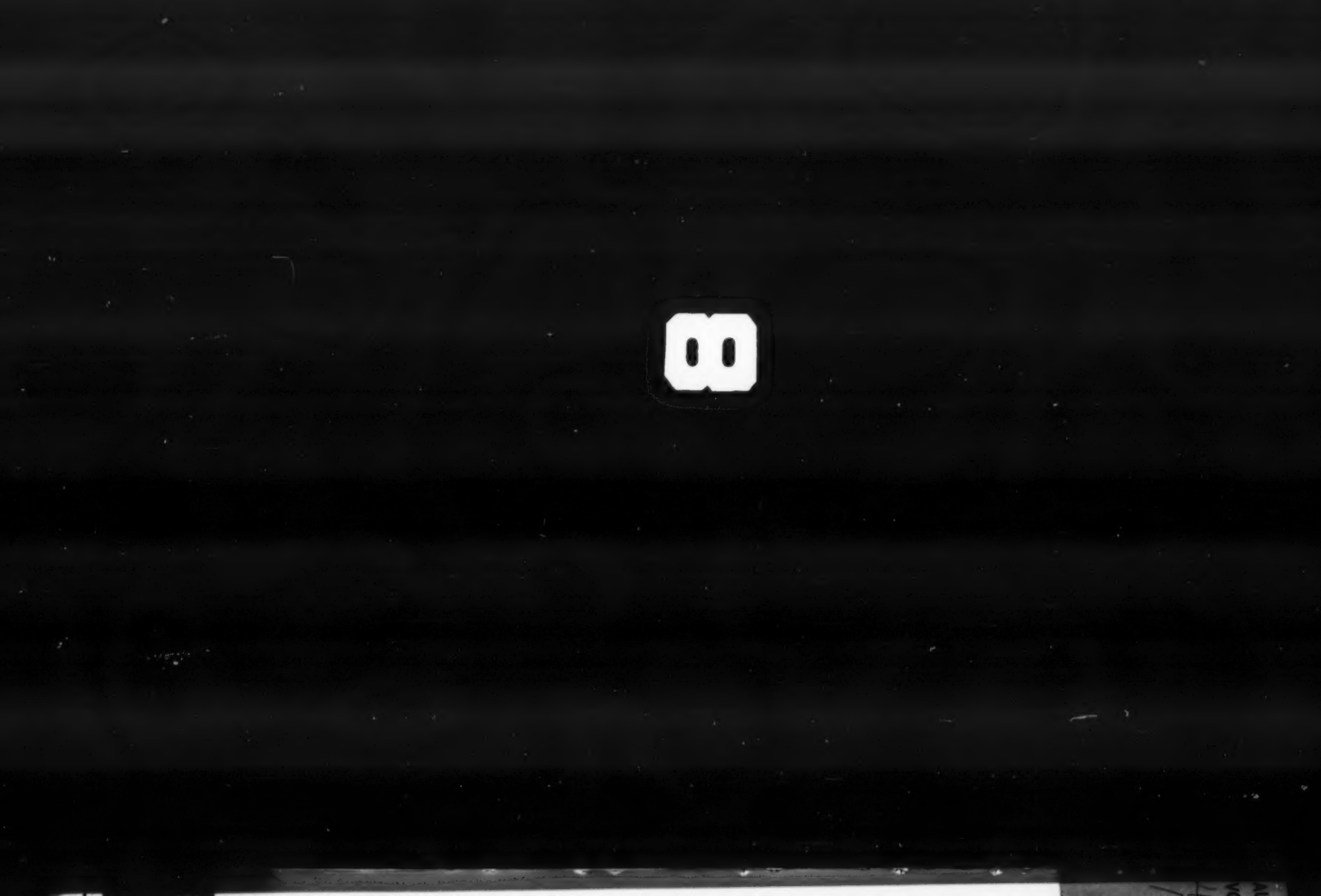
Corn States

Bi-Sulfadex

An effective, pyrogen-free solution for treatment of sulfa-sensitive infections, Bi-Sulfadex contains equal proportions of rapidly absorbed sodium sulfamerazine (for its wide range of bacteriostasis, low toxicity, and ability to maintain therapeutic blood levels for longer periods) and sodium sulfathiazole (for its rapid action and well-known therapeutic value). Bi-Sulfadex is supplied in cartons of six 500 cc. vials.

Tri-Sulfadex

A potent combination of three highly effective sulfonamides (assuring maximum therapeutic effect, broad bacteriostatic range, and lasting action) Corn States Tri-Sulfadex, near neutral in pH, is gentle to the tissues. Tri-Sulfadex contains 4 grams each of sulfamerazine, sulfathiazole, and sulfadiazine per 100 cc. This formulation is supplied in cartons of twelve 250 cc. vials.

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LABORATORIES, INC.